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PERFORMANCE EVALUATION OF THE OPTICAL CROSSWIND PROFILER.(U)
AUG 79 R RODRIGUEZ , W J VECHIONE
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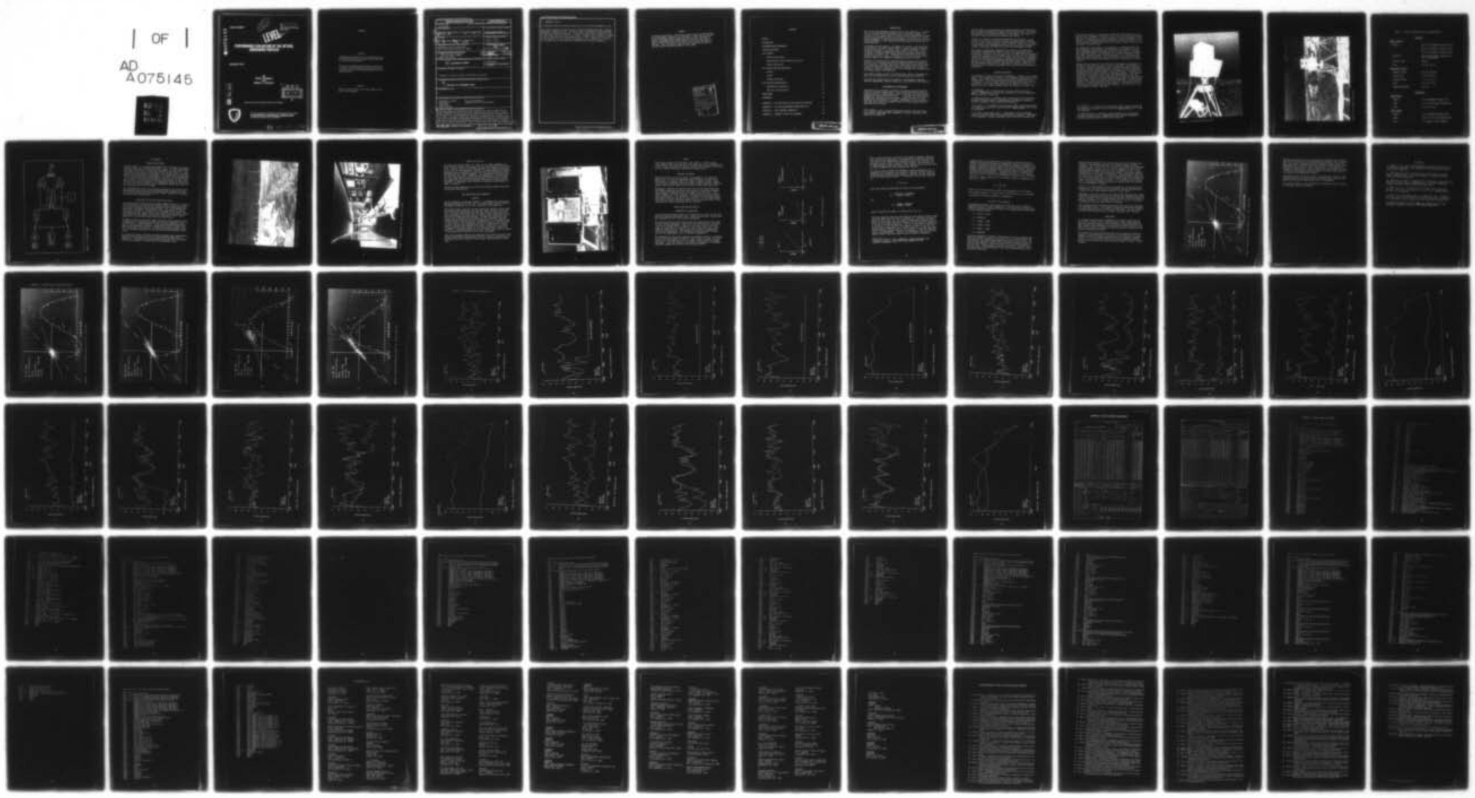

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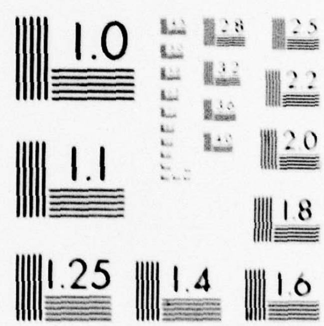

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PERFORMANCE EVALUATION OF THE OPTICAL CROSSWIND PROFILER

AUGUST 1979

By
Ruben Rodriguez
and
William J. Vechione

Approved for public release; distribution unlimited

US Army Electronics Research and Development Command
ATMOSPHERIC SCIENCES LABORATORY
White Sands Missile Range, NM 88002

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Field measurements of integrated path crosswinds were made at Biggs Optical Range, Biggs Army Airfield, Fort Bliss, Texas, during the period of 31 January to 8 March 1978. The measurements were made with the Optical Crosswind Profiler (OCP), a bistatic system that measures crosswinds at six locations along its path by detecting and analyzing the movement of atmospheric scintillations. This report describes the performance evaluation test, test support equipment, and data collection methodology. Data collected with this sensor were compared

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20. ABSTRACT (cont)

Cont

to integrated path wind averages measured by the calibrated anemometer array.

This report presents X-Y scatter plots, derived weighting functions, and wind measurement comparison plots. Results of this test showed that the alignment procedure is lengthy and tedious. Furthermore, simultaneous alignment of the six OCP sensors is very difficult to attain. However, once a sensor is aligned at 500 m, wind velocity values measured with it fall within 8 percent of the values obtained from the calibrated anemometer array. Operation at 2000 m is not reliable due to difficulties in obtaining and retaining alignment.

PREFACE

The authors thank Messrs. Glenn Hoidale, David Favier, and William Hatch of the Atmospheric Sensing Division and Messrs. John Hines and Charles White of the Meteorological Support Division for their assistance in manning the Meteorological Optical Measuring System and the Optical Range at Biggs Army Airfield, Fort Bliss, Texas, during the conduct of the test. Also, the authors thank SP4 Ted R. Caprio for his help in plotting some of the data presented in this report.

CONTENTS

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INTRODUCTION

The state of the atmosphere affects tactical army operations; in particular it can determine the deployment and use of weapon systems. To increase relative combat power of friendly forces, meteorological parameters must be measured at the time and location of the action. An important parameter in atmospheric measurements, particularly for ballistic weapon employment, is the crosswind velocity along the trajectories of the projectiles.

The purpose of this report is to present the results of the evaluation of the Optical Crosswind Profiler (OCP), a sensor designed to measure average crosswinds at six points along its path of operation. This evaluation is based on comparative data taken during a test period of 31 January to 8 March 1978 at Biggs Optical Range (BOR), Biggs Army Airfield, Fort Bliss, Texas. Included as part of the report are daily weather summaries of atmospheric parameters prevailing at BOR.

The OCP is an active optical system designed to measure the crosswind velocity at six regions along the path extending from the receiver to the transmitter. Although the OCP was tested under actual field conditions, the evaluation tests were conducted cognizant that the OCP is presently a research instrument and not yet intended for prolonged field use without proper reconfiguration.

This report presents results of collected data, with an evaluation and analysis that determine the accuracy and applicability of the OCP.

This work was accomplished by personnel of the Atmospheric Sensing Division, Atmospheric Sciences Laboratory, under DA Task 1L162111AH71A3.

INSTRUMENTATION REQUIREMENT

Crosswinds along a ballistic projectile trajectory contribute significantly to the total weapon error. Walters[1] has shown that direct fire crosswind errors on representative armor projectiles are significantly greater than head and tail wind errors. To increase the first-round-hit probability, crosswinds must be accurately known just before firing. Knowledge and application of crosswind information to fire control systems can also increase the standoff range of friendly weapons without degrading their accuracy.

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[1]D. L. Walters, 1975, "Crosswind Weighting Functions for Direct-Fire Projectiles," ECOM Report 5570, Atmospheric Sciences Laboratory, White Sands Missile Range, NM

Several remote crosswind sensors have been developed in the recent past. Four systems were evaluated at BOR during the test period. The evaluation results of the OCP are presented in this report. The results of the other system evaluations are reported separately.[2,3]

The OCP is a bistatic crosswind measurement system that can: (1) be used in research that may improve present wind measurement techniques, (2) aid in the characterization of the atmosphere, especially as related to high energy laser propagation effects, and (3) serve as a reference system in evaluating and analyzing future wind measurement systems.

The concept of operational feasibility was shown by the Saturation Resistant Crosswind Sensor (SRCS),[4,5] which is a predecessor system of the OCP. Basically, the OCP consists of six SRCS, each with a weighting function maximized at a different range such that all six together sample the crosswind velocity at six regions along the path of operation. In 1977, an exploratory development prototype of the OCP was completed and this is the system evaluated and discussed herein. Results of the OCP performance evaluation will contribute the necessary data base to continue future crosswind development and to satisfy stated tactical requirements.

SYSTEM DESCRIPTION

The components of the OCP include a transmitter, a receiver, and a power supply. The transmitter consists of two incoherent light sources of different sizes.[5] The smaller source has an optical aperture of 8.4 cm in diameter and uses a frosted quartz-iodine lamp at the focus of a concave mirror. The larger light source has an aperture of 27.9 cm in diameter and uses a quartz-iodine lamp at the focus of a Fresnel lens.

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[2]R. Rodriguez, 1979, "Evaluation of the Passive Remote Crosswind Sensor," ERADCOM Report, ASL-TR-0032, Atmospheric Sciences Laboratory, White Sands Missile Range, NM

[3]R. Rodriguez and W. J. Vechione, 1979, "Evaluation of the Saturation Resistant Crosswind Sensor," ERADCOM Report ASL-TR-0035, Atmospheric Sciences Laboratory, White Sands Missile Range, NM

[4]G. R. Ochs, S. F. Clifford, and Ting-i Wang, 1976, "Laser Wind sensing: the effects of saturation of scintillation," Applied Optics, Vol 15, No. 2, pp 403-408

[5]G. R. Ochs, Ting-i Wang, and E. J. Goldenstein, 1977, "An Optical System for Profiling Wind and Refractive-Index Fluctuation," ECOM Report 77-7, Atmospheric Sciences Laboratory, White Sands Missile Range, NM

The receiver consists of three pairs of apertures that measure 6.7, 9.8, and 15.2 cm in diameter. A concave mirror at each one of these apertures collects the wind data and focuses the data on a dual photodiode. A pre-amplifier is collocated with each photodiode to amplify the signal at the source, thereby avoiding transmission of low level signals which are very susceptible to noise pickup.

The three pairs of apertures in the receiver, in combination with the two transmitter light sources, are equivalent to six sensors, but each with a different weighting function due to the difference in receiver and transmitter optics. By "peaking" each of these sensors at a different range, crosswind velocity can be measured at six localized regions along the path of operation. Figures 1a and 1b show a front and rear view of the OCP that was evaluated, while table 1 summarizes its characteristics.

Because the OCP consists of six SRCS units, the method of operation of the OCP is essentially the same as for a single SRCS. The operation of the SRCS is based on detection of the scintillation patterns produced by thermal gradients and transported by the wind. As each of the photodiodes detects the incoming signal,[4] the fluctuations in irradiance are combined by the analyzer to obtain a covariance function. The slope of this curve at zero delay time is inversely proportional to the time needed for a particular scintillation pattern to travel from one detector to the other. Since the distances between photodiodes is constant, the analyzer then derives the wind velocity from the slope of the covariance function. A block diagram of the OCP (figure 2) illustrates the functional block electronics required for operation. This circuit is virtually identical to that of the SRCS.[3]

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[4]G. R. Ochs, S. F. Clifford, and Ting-i Wang, 1976, "Laser Wind sensing: the effects of saturation of scintillation," Applied Optics, Vol 15, No. 2, pp 403-408

[3]R. Rodriguez and W. J. Vechione, 1979, Evaluation of the Saturation Resistant Crosswind Sensor, ERADCOM Report ASL-TR-0035, Atmospheric Sciences Laboratory, White Sands Missile Range, NM

Figure 1a. OCP receiver (front view).

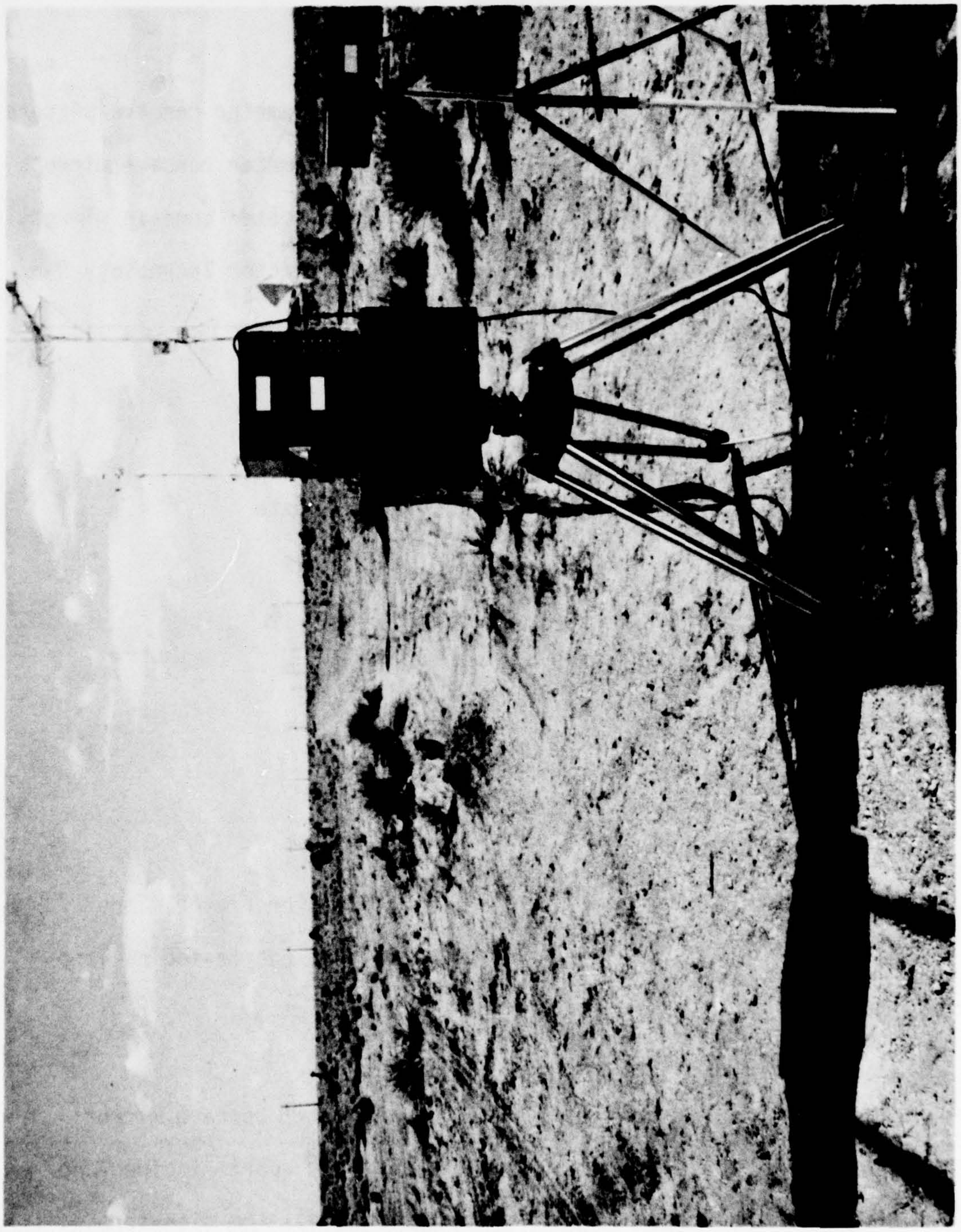

Figure 1b. OCP receiver (rear view).

TABLE 1. OPTICAL CROSSWIND PROFILER CHARACTERISTICS

Receiver	
Optics Section	
Optics	Two 15.2 cm diameter concave mirrors
	Two 9.8 cm diameter concave mirrors
	Two 6.7 cm diameter concave mirrors
Detectors	Six United Detector Technology Pin Spot 2D Photodiodes
Field of View	10 mrad
Size	43 x 45 x 30 cm
Electronics Section	
Function Switch	Run and calibrate
Scale Switch	5, 10, 20 m/sec
Location Switch	1, 2, 3, 4, 5, 6
Size	25 x 30 x 32 cm
Power Requirements	120 V AC
Transmitter	
Large Source	
Optics	27.9 cm diameter Fresnel lens
Lamp	55 W, 12 V DC quartz-iodine lamp
Size	57 x 30 x 28 cm
Small Source	
Optics	8.4 cm diameter concave mirror
Lamp	35 W, 12 V DC quartz-iodine lamp
Size	43 cm long, 17.5 cm diameter

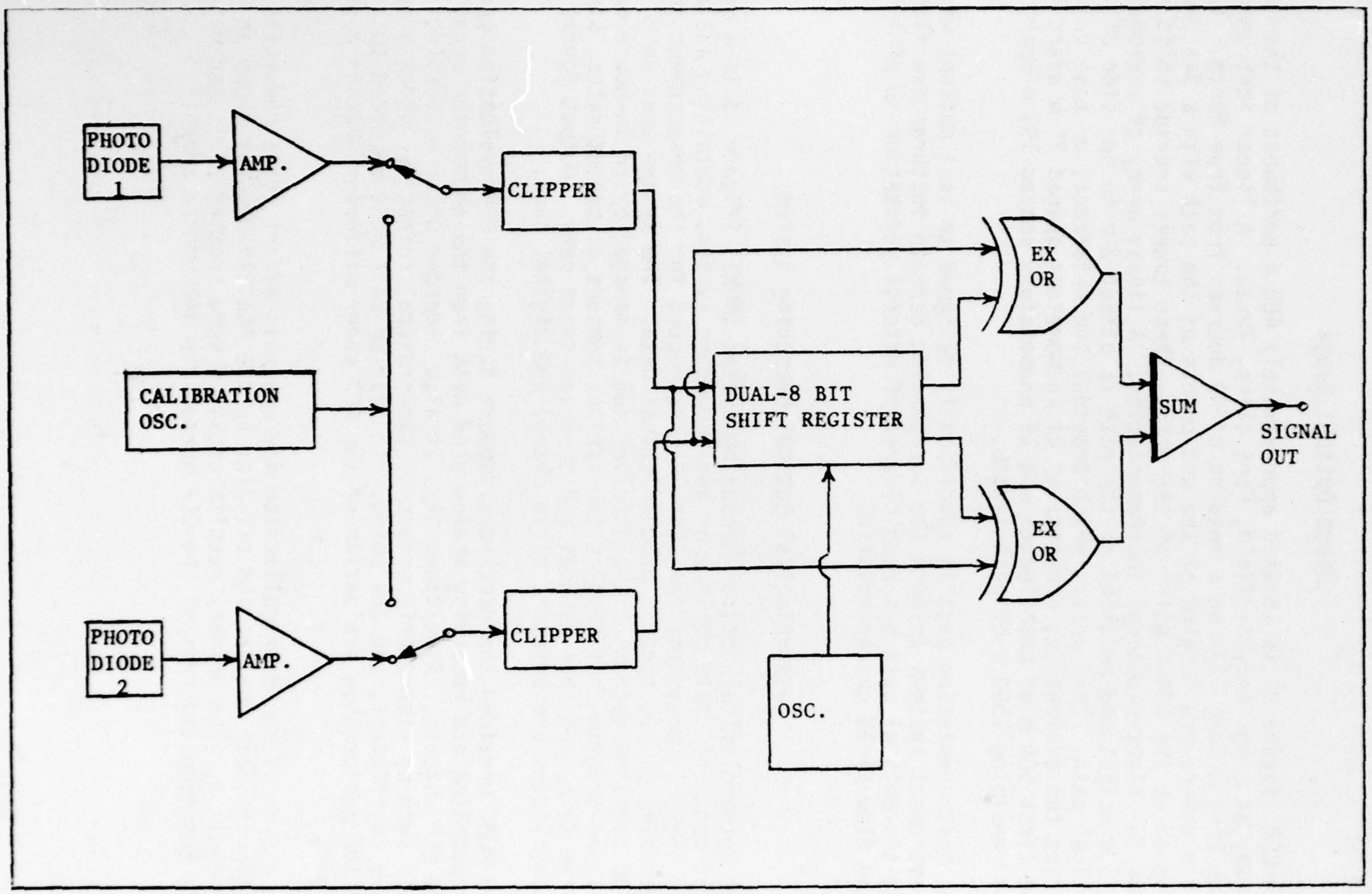

Figure 2. OCP block diagram.

TEST SUPPORT

Biggs Optical Range

The BOR (figure 3) is located approximately 400 m northwest of the main runway at Biggs Army Airfield, Fort Bliss, Texas. A linear instrumented path 2064 m long lies on a heading of 49 degrees from True North. Two 3.5-m towers are located at the end points of the path with a 3-m tower aligned at the 500-m point of the path. These towers provide solid test beds for electro-optical instrumentation. A linear array of anemometers at 3 m height and parallel to the path is offset 3 m to one side of the optical path. This array, which provided the reference, or base values during the evaluation, consists of 21 anemometers spaced 25 m apart for the first 500 m of path length and 15 anemometers spaced 100 m apart for the remaining 1500 m of path length.

The instrumentation path is specifically designed to test optical wind measurement systems because the surrounding terrain features are flat, and the optical path has been cleared of natural vegetation to minimize wind flow field characteristics.

Meteorological Optical Measuring System

The Meteorological Optical Measuring System (MOMS) (figure 4) is a mobile, self-contained data collection and reduction system, containing analog and digital subsystems specifically engineered for the measurement and recording of atmospheric meteorological data. The system uses an HP 2100 computer system as a controller and is managed by an in-house developed program that samples the various sensors at preset rates, stores these data, and then reduces and analyzes these data. Output format capabilities are printer, strip chart, and digital tape.

The MOMS provided the necessary support during the OCP evaluation period by sampling and recording analog wind data from the anemometer array and OCP outputs. Simultaneously, it also recorded other meteorological data such as atmospheric pressure, temperature, refractive index structure coefficient, and dew point. The latter data were recorded to aid in the performance evaluation of the OCP under different weather conditions.

As a part of the data collection and analysis effort, data reduction was conducted both on-line and off-line by the FORTRAN program shown in appendix D. The primary results provided were scatter plots and weighting function diagrams of the OCP versus the anemometer array.

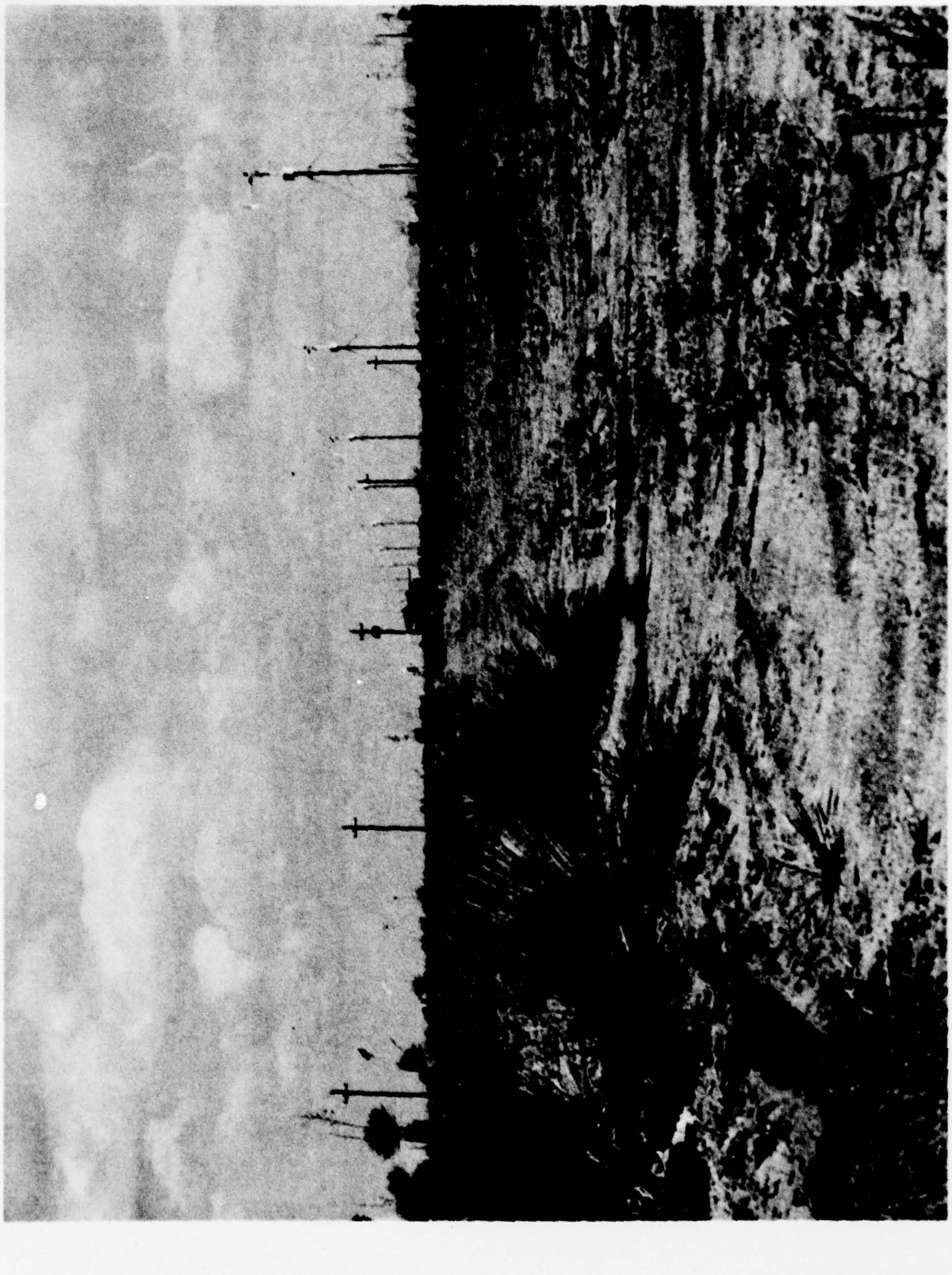

Figure 3. Biggs optical range.

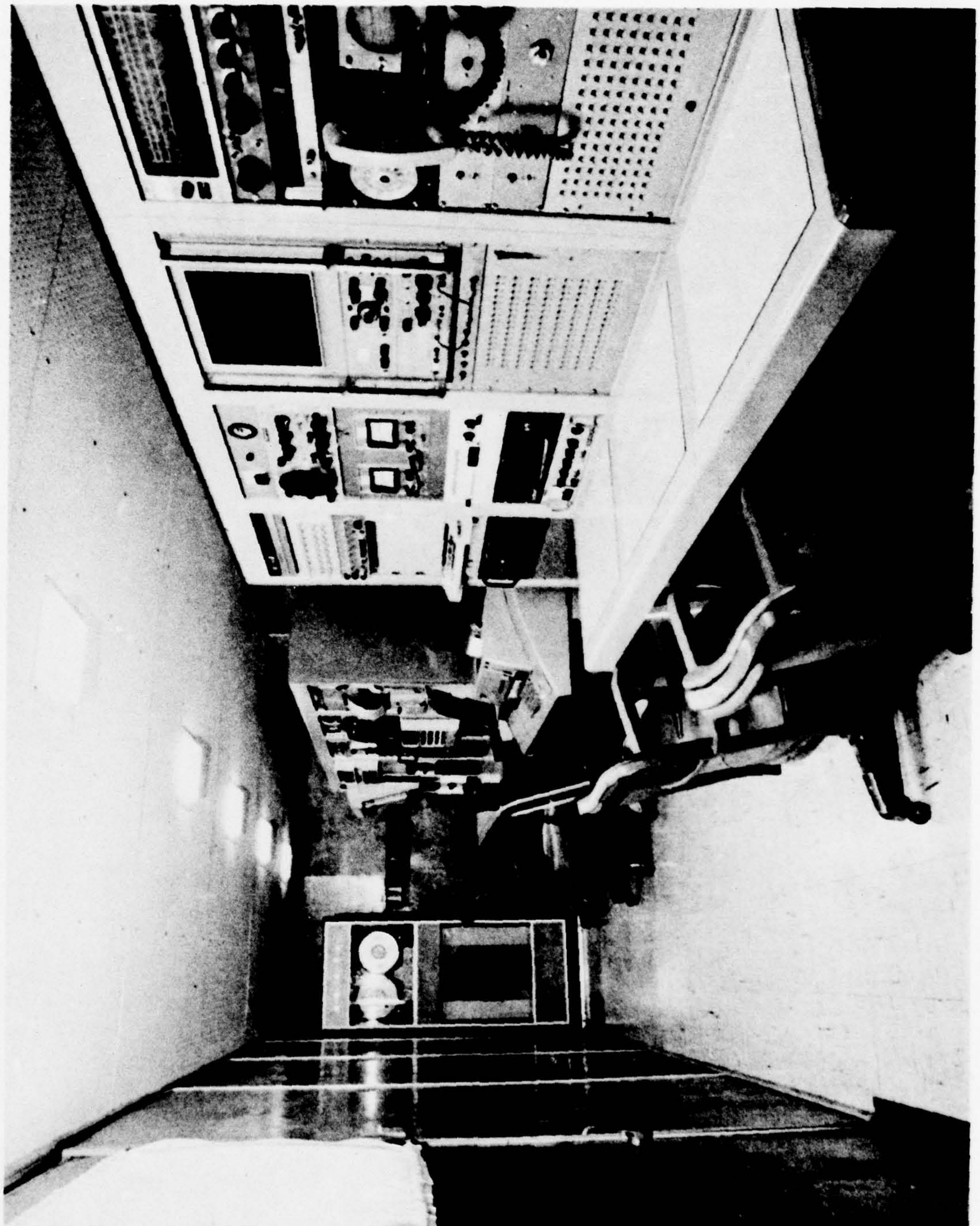

Figure 4. Meteorological optical measuring system.

Remote Sensing Van

The Remote Sensing Van (RSV) is a 5-ton, 6 by 6, M820 expandable van which contains inherent prime-mover mobility and provides test-bed facilities. The RSV "folds" to standard van width for transport and expands to 4.3 m for in situ operation. The RSV is a stable platform for optical equipment tests and provides test-bed facilities by housing test equipment and ancillary support equipment. An environmental isolation partition with two 30 by 45 cm integral optical windows has been fabricated for use so that the rear doors can be opened for optics line of sight test capability while test environmental conditions inside the RSV are retained. A "downrange" view of the RSV in operating configuration is shown in figure 5.

The RSV provided shelter for the OCP during inclement weather thus preventing test interruptions.

TEST DESCRIPTION AND PROCEDURES

General

The OCP evaluation mission was twofold: to determine the accuracy and weighting function of the OCP, and to evaluate effects due to vibration and weather conditions (i.e., rain, overcast) on OCP operation.

Operational setup of the OCP involves placing the receiver at one end of the path and the transmitter (two separate light sources) at the other end. To insure proper operation, the light sources should have an angular separation of 6.8 mrad, and the smaller light source should be on the left as viewed from the receiver. Although the transmitter light sources can be aligned with the naked eye, the transmitter could be aligned faster and more accurately by attaching a 7.5 cm retroreflector to the receiver. The receiver was initially aligned by using the built-in sight, but the final alignment consisted of adjusting the receiver slowly in azimuth and elevation while using a small mirror to observe the images of the light sources on the dual photodiodes. Before the receiver is considered aligned, each of the light sources must be visible in the proper half of each of the six dual photodiodes.

After the alignment procedure was completed, the receiver and both transmitting light sources were secured firmly to avoid any deterioration of the signal and also to prevent "false signal" generation due to vibration.

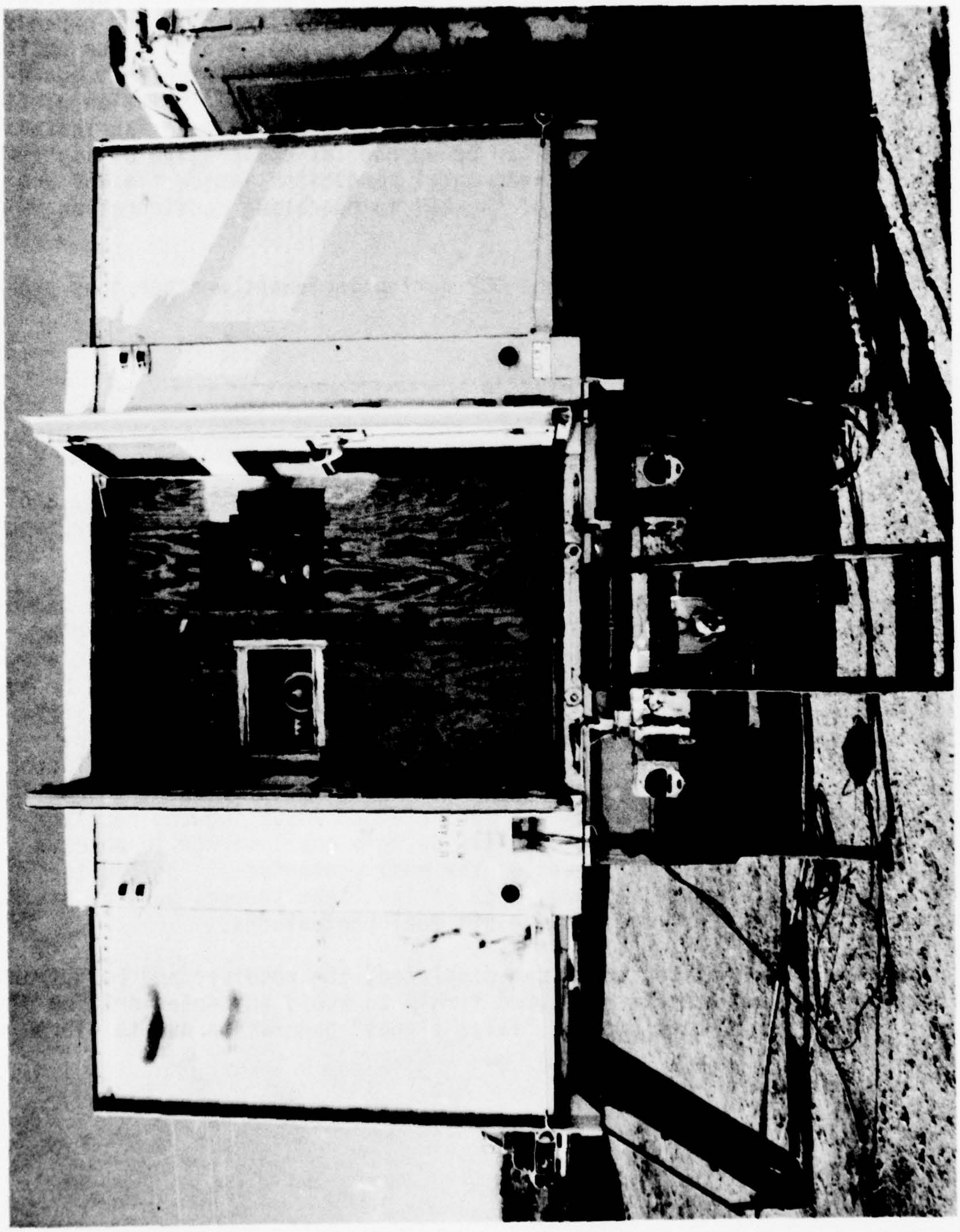

Figure 5. Remote sensing van.

Ranges

The OCP was tested at 500 and 2000 m path lengths. Signal-to-noise ratio (SNR) at 500 m was sufficient for proper lock-on, but extending the range to 2000 m decreased the SNR and increased the alignment difficulties to such a degree that proper operation was intermittent.

Weather Conditions

Because the OCP is an active system, its operation is not limited to daytime use. In fact, the operating range increases at night due to the absence of extraneous light that tends to degrade the SNR. Operation on clear or overcast days was reliable at 500 m; however, operation became erratic during light rain and finally ceased under heavy rain.

Atmospheric conditions during the entire test period ranged from very low thermal turbulence to values large enough to saturate the Campbell Laser Crosswind System Model CA-9 at ranges larger than 500 m. A detailed summary of weather conditions existing during the test period is shown in appendix C. This appendix is included to provide the prevailing weather conditions during the test period for all evaluated systems. These data are from the National Weather Service located at the El Paso International Airport approximately 6 km from BOR.

DATA COLLECTION AND RESULTS

Mathematical Background

In statistical bivariate analysis, a scatter plot is useful for the evaluation of measured experimental data. During the OCP test, scatter plots were generated to aid in the accuracy evaluation.

The abscissa values for the scatter plots were determined by the output of the reference anemometer array, while the ordinate values were those from one of the OCP outputs. Each pair of values, taken at the same time, was considered as a coordinate in the scatter plot, and a large number of these pairs were used in each plot to make the comparison statistically meaningful. The FORTRAN IV program developed to sample and plot the experimental data is included in appendix D.

The usefulness of the scatter diagram in evaluation analysis is indicated by the three plots shown in figure 6. Plot A shows a scatter plot that consists of a straight line with a 45-degree slope and passing through the origin. This case depicts a one-to-one correspondence, or complete agreement, between the reference and evaluated systems.

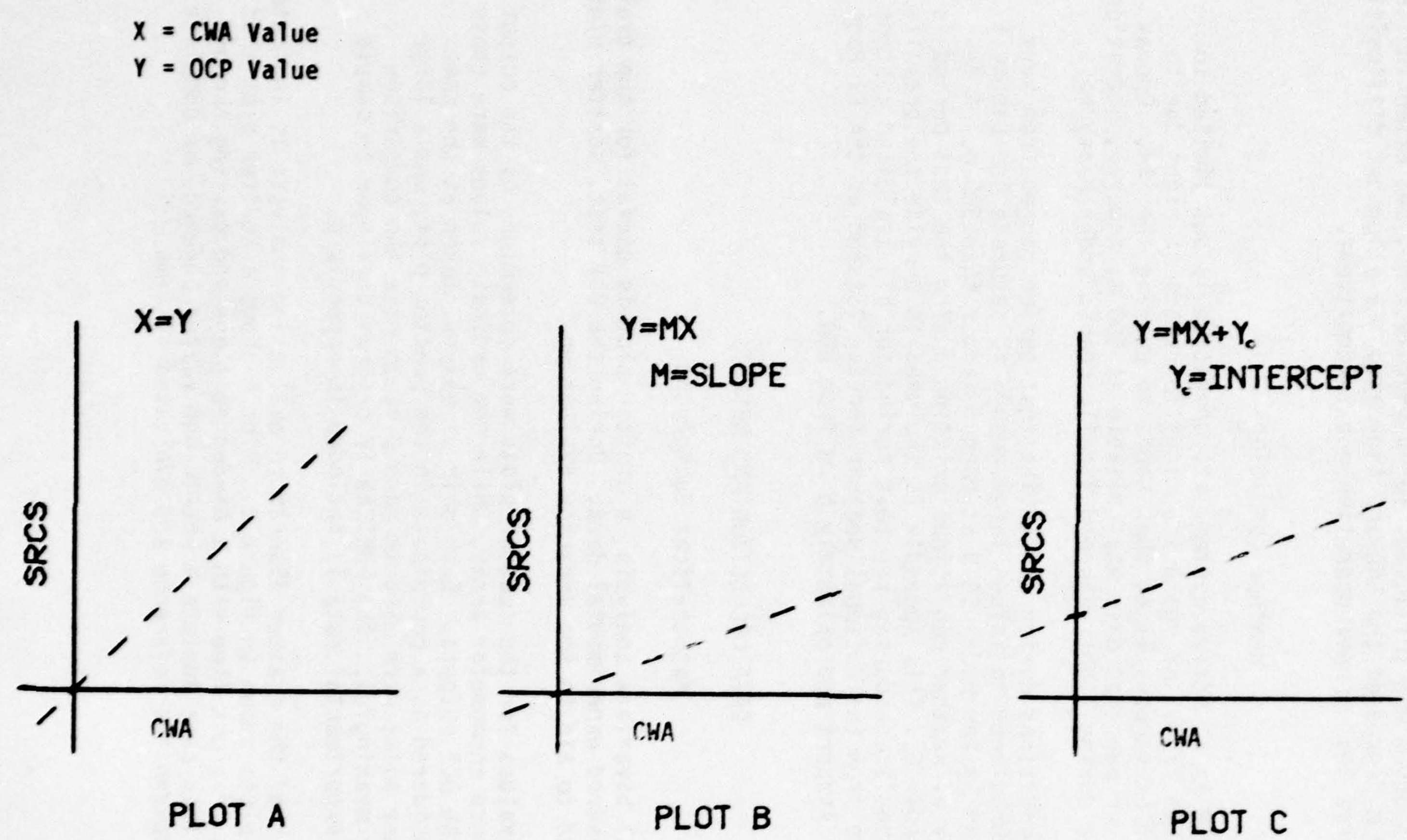

Figure 6. Typical scatter plots.

Plot B, where the slope of the line is no longer 45 degrees, indicates that the ordinate values have to be adjusted by including a multiplicative factor in the mathematical expression relating the reference and evaluated systems. Plot C shows a further change: the resultant line no longer passes through the origin. This signifies that an offset value, Y_0, must be added to the final mathematical relation.

All pairs of points plotted to construct a scatter diagram will very seldom fall in a straight line; therefore, after all the data pairs generated during the OCP test were plotted, a straight line was fitted by using the least squares method.[6] The resultant line was then expressed as

$$Y = A_0 + A_1 X$$

where the constant coefficients are given by the expressions

$$A_0 = \frac{(\Sigma Y)(\Sigma X^2) - (\Sigma X)(\Sigma XY)}{N(\Sigma X^2) - (\Sigma X^2)}$$

and

$$A_1 = \frac{N(\Sigma XY) - (\Sigma X)(\Sigma Y)}{N(\Sigma X^2) - (\Sigma X)^2}$$

where N indicates the number of ordered pairs (X_n, Y_n).

The above equations show that the method of least squares allows extreme values to affect the final result considerably. Therefore, during the data collection phase, care was taken to investigate extremely offset values to insure that they were legitimate and not caused by mechanical or electrical system malfunctions. Also it is necessary to consider the values close to zero carefully and prudently because of the fact that the mechanical anemometers have a certain amount of friction which generates erroneous results when the wind velocity is below the threshold value of the anemometers. However, the anemometers used minimized this anomaly because they were research quality propeller anemometers.

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[6]Athanasios Papoulis, 1965, Probability, Random Variables, and Stochastic Processes, McGraw-Hill Book Company, New York

Scatter plots can be generated by using either a straight average or a weighted average of the mechanical anemometer outputs as the abscissa values. The weighted average values should be weighted according to the weighting function of the instrument being tested, the OCP in this case. However, before these weighted values could be used, the OCP weighting function had to be determined. The weighting function is computed by considering different groups of anemometer outputs as a least squares basis set; that is, the OCP wind measurements, denoted by W_s, are represented as a linear combination of m different groups of anemometer outputs, W_i, so that

$$W_s = \sum_{i=1}^{m} a_i W_i ,$$

where a_i are the correlation coefficients determined by an m^{th} order least squares analysis. Various sets of coefficients, a_i, are obtained by employing different groupings of anemometers.

Results of Data Analysis

The weighting functions and scatter plots obtained for the different operating ranges are shown in appendix A. For path length of 500 m the values of the OCP are related to those of the computed wind average (CWA) by the following formulas:

$Y_1 = 0.437X - 0.084$

Y_2 = Undefined

$Y_3 = 0.538X - 0.048$

$Y_4 = 0.358X + 0.941$

$Y_5 = 0.827X - 0.084$

Y_6 = Undefined

where the subscripts 1 through 6 indicate each of the six readings generated by the OCP. Sensors 2 and 6 could not be calibrated before the test because of malfunctioning preamplifiers and/or faulty wiring. Because of the tight test schedule and the method of hard-wiring used in the electronic boards, it was not feasible to correct the problems at the test site. Intermittently, data were collected by sensors 2 and 6, but these data are not presented in this report because they are unreliable and inaccurate.

Because the OCP consists of six sensors that have to be aligned simultaneously, the alignment procedure is extremely tedious and time-consuming. Most of the time, only three or four sensors can be aligned properly, which is easily seen in the data gathered on 3 March 1978 and presented in appendix B in the form of comparison plots. At the beginning of this data collection phase, sensors 1 and 3 were properly aligned, while 4 and 5 were not maximized. At approximately 1010, sensor 2 fell out of alignment. The entire OCP was realigned at 1040 with the result that sensors 4 and 5 began to collect data; but alignment of sensor 3 was not maximized, and sensor 1 fell completely out of alignment. The weighting function diagrams and scatter plots also show the lack of simultaneous alignment.

Figure 7 is a representative plot that exemplifies the method of data presentation. The scatter plot and weighting function are combined in a figure to show a more complete analysis of each sensor.

Comparison of the time function plots when the OCP operated over a 500-m range shows that when the sensors are aligned their measured value falls within 8 percent of the value measured by the CWA at least 90 percent of the time. However, it is extremely difficult to align all six sensors simultaneously and have them remain in alignment.

The alignment problem increased considerably when the OCP was operated over the 2000-m range. The alignment procedure became almost impossible to perform and the results obtained were unreliable. For this reason, data from the OCP operating at the 2000-m range were not collected.

CONCLUSIONS

On the 500-m range and under predominant area weather conditions (no rain, hail, or snow), each of the OCP sensors, when aligned properly, measured crosswind averages within 8 percent of those measured by the CWA. However, under moderate to severe adverse weather conditions, the OCP was not accurate or reliable in operation due to a decrease of SNR below its operating threshold.

The receiver and both transmitting light sources should be solidly attached to a firm foundation to eliminate any vibration which is interpreted by the OCP as signal information and thus generates erroneous results. If at all possible, the receiver and transmitter should be placed inside buildings and operated through windows in order to remain aligned.

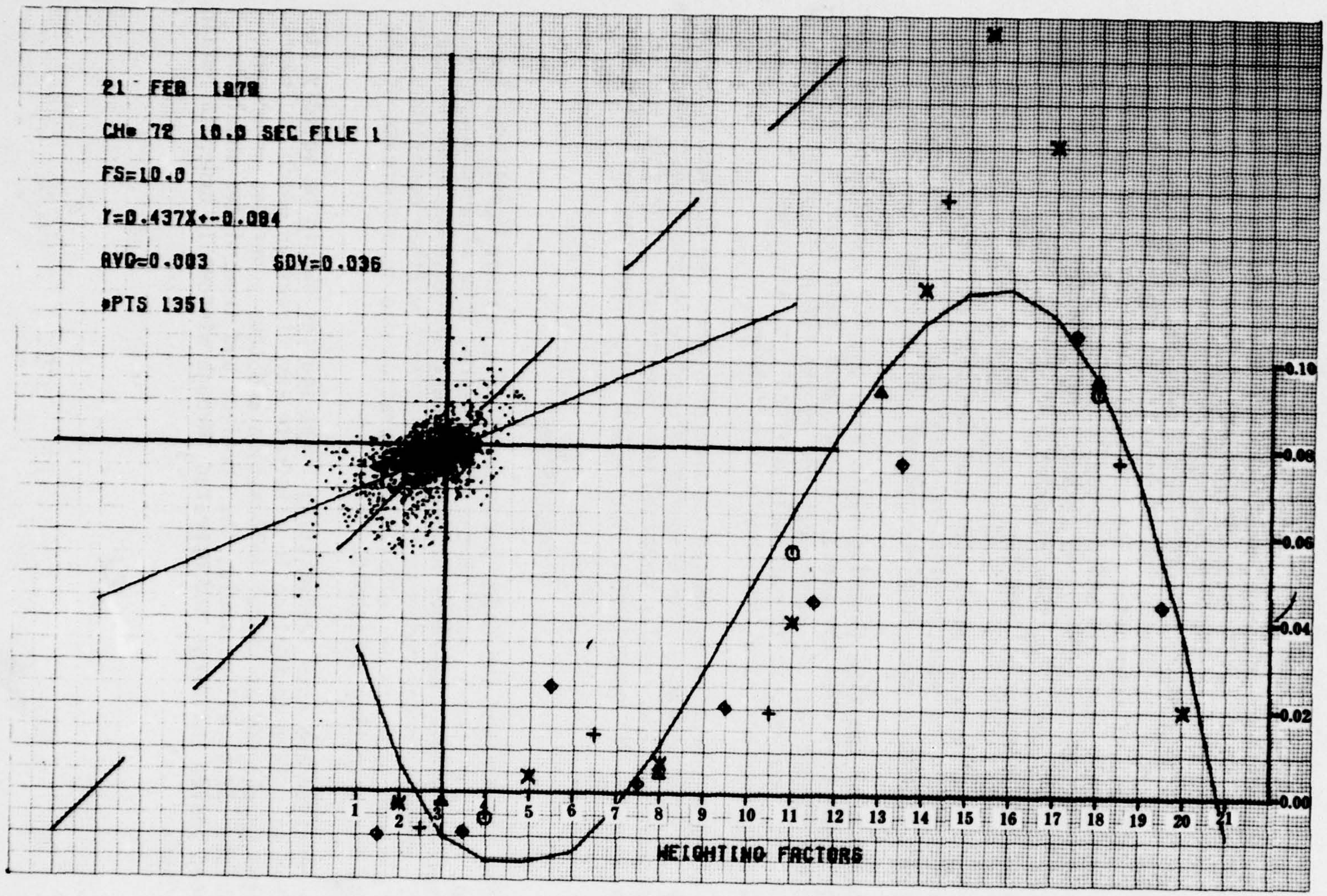

Figure 7. Scatter plot and weighting function. OCP: sensor 1, 500-m range.

The OCP transmitting light sources should be aligned by using a retro-reflector at the receiver and a boresighted telescope at the transmitter end. The receiver alignment should be checked by observing the dual photodiodes and corrected if necessary so that each light source can be observed in half of each of the six photodiodes. This procedure is lengthy and tedious and is almost impossible to perform when the range is 2000 m or more because reflected image of the small light source is not visible on the photodiode surfaces.

Troubleshooting of the circuit boards in the electronic section of the receiver was difficult because the circuit boards were "wired-in" and therefore could not be easily pulled out or interchanged.

At a range of 2000 m or more, operation of the OCP was erratic, and no reliable data could be collected.

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4. Ochs, G. R., S. F. Clifford, and Ting-i Wang, 1976, "Laser Wind sensing: the effects of saturation of scintillation," Applied Optics, Vol 15, No. 2, pp 403-408.

5. Ochs, G. R., Ting-i Wang, and E. J. Goldenstein, 1977, "An Optical System for Profiling Wind and Refractive-Index Fluctuation," ECOM Report 77-7, Atmospheric Sciences Laboratory, White Sands Missile Range, NM.

6. Papoulis, Athanasios, 1965, Probability, Random Variables, and Stochastic Processes, McGraw-Hill Book Company, New York.

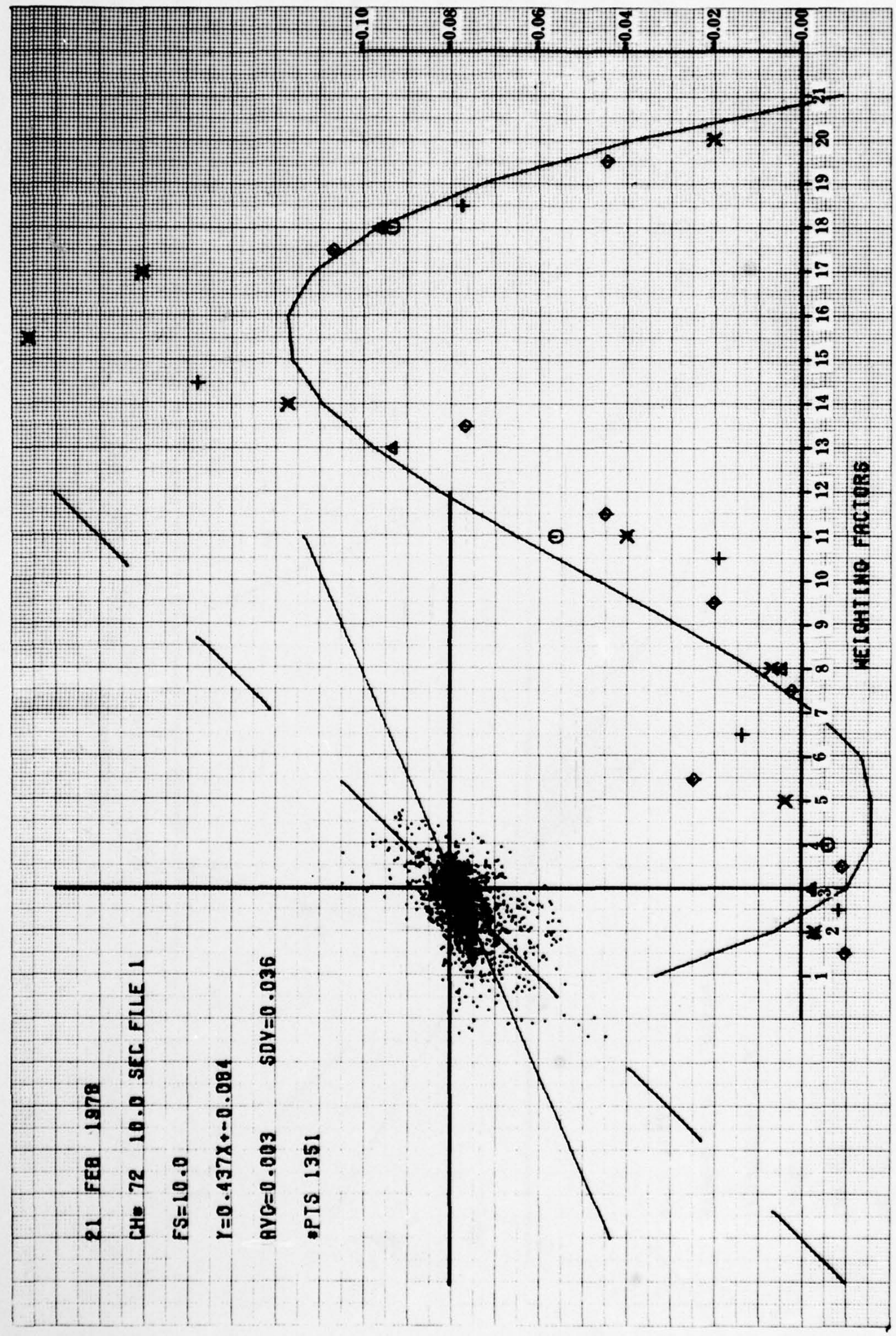

Figure A-1. Scatter plot and weighting function. OCP: sensor 1, 500-m range.

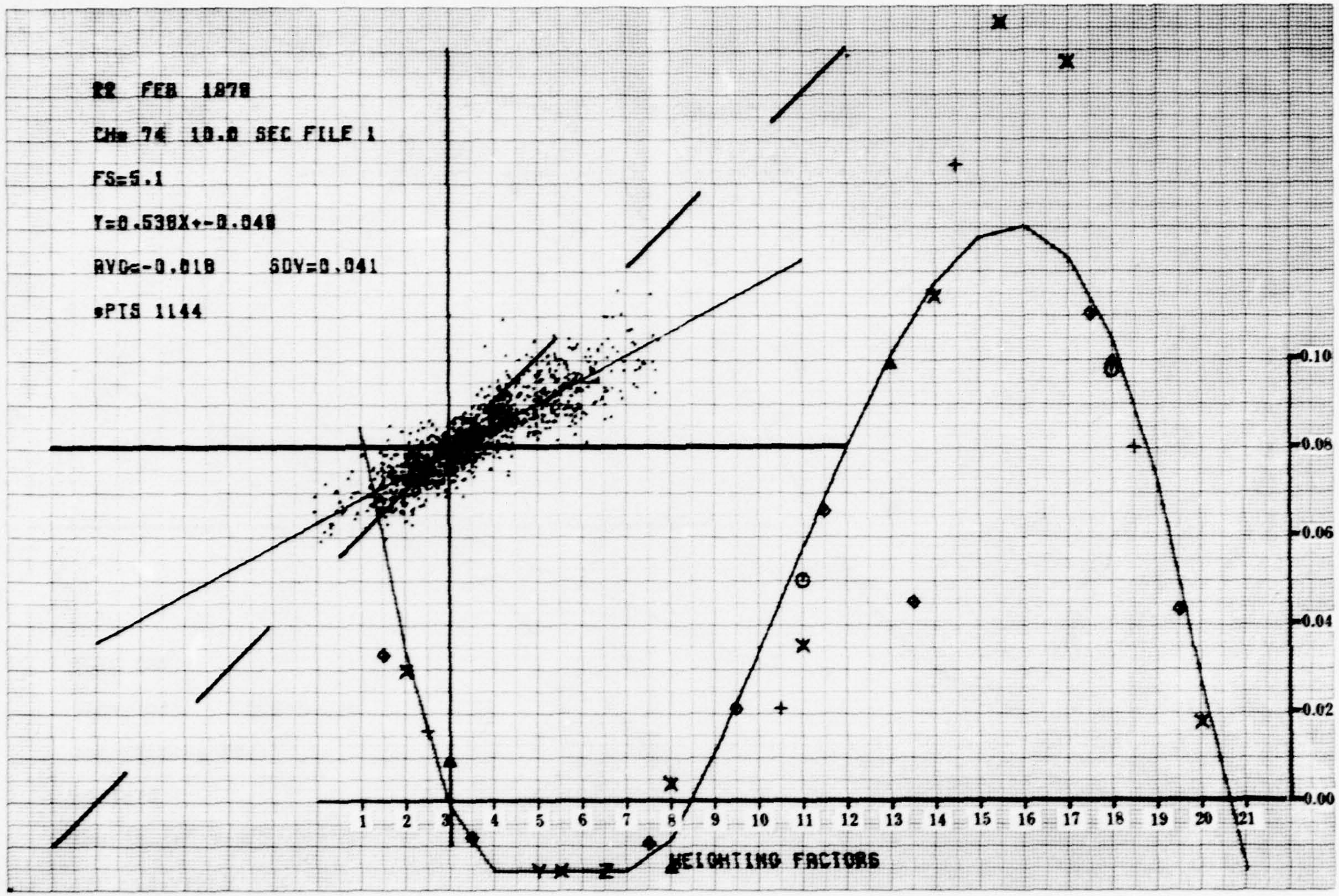

Figure A-2. Scatter plot and weighting function. OCP: sensor 3, 500-m range.

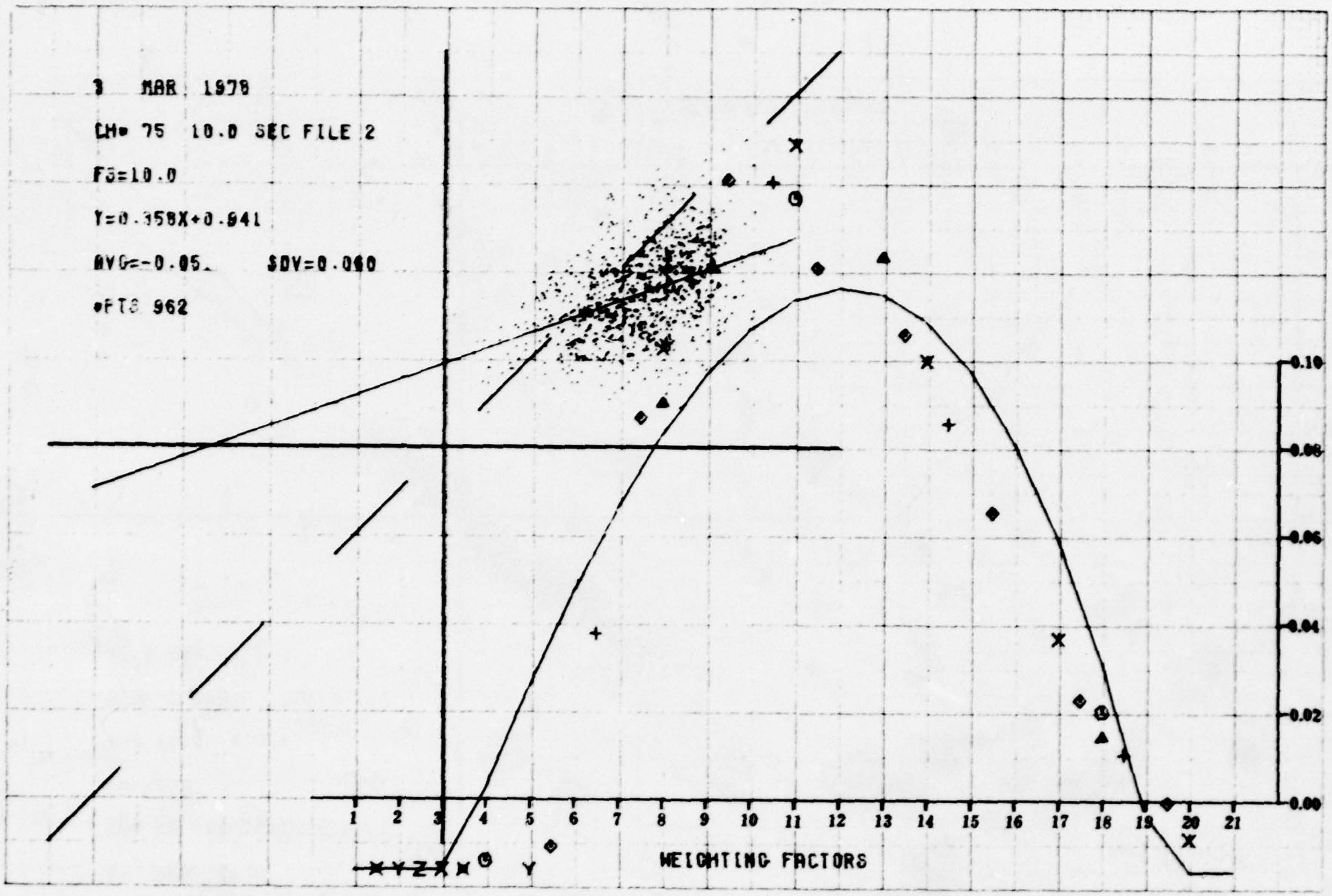

Figure A-3. Scatter plot and weighting function. OCP: sensor 4, 500-m range.

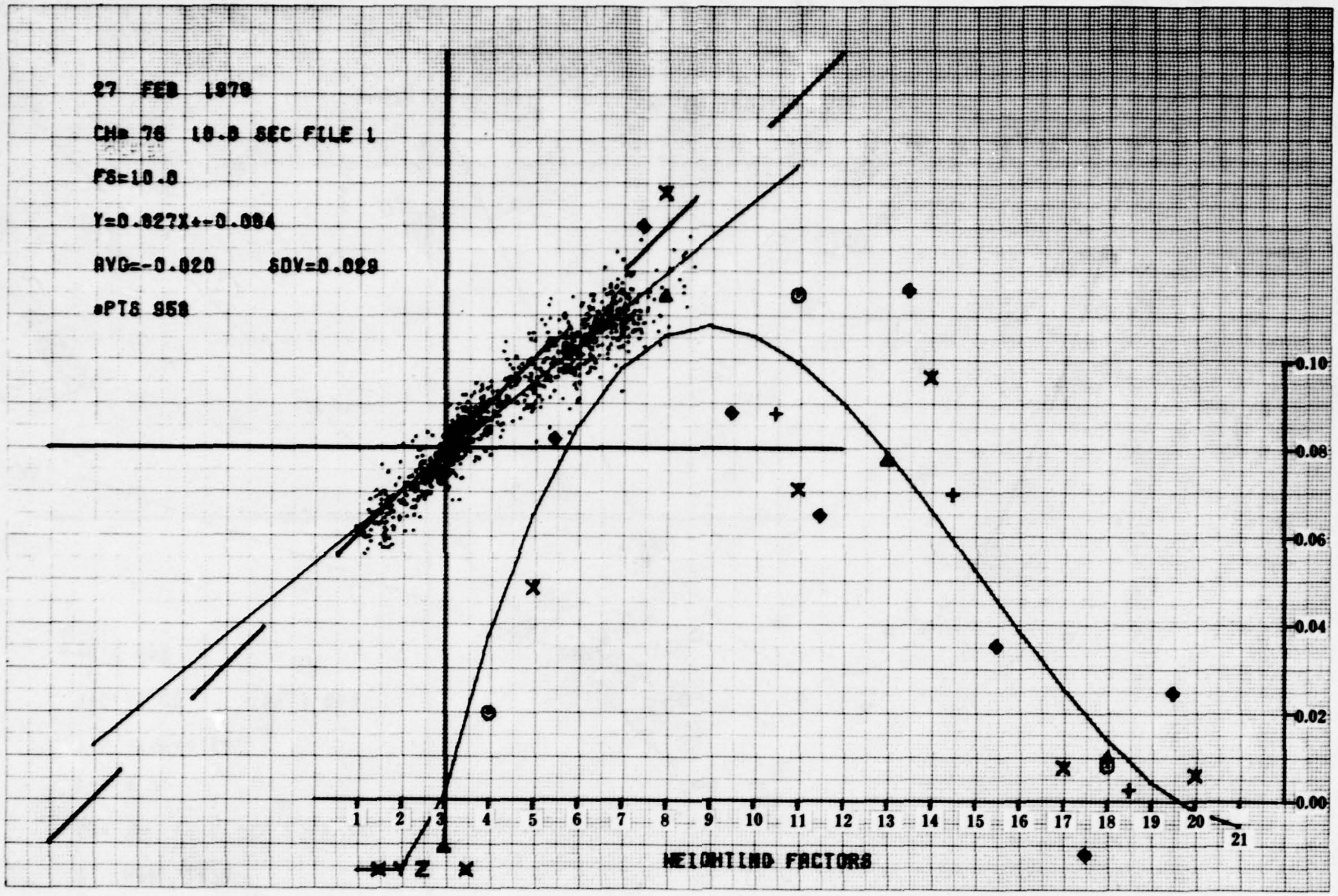

Figure A-4. Scatter plot and weighting function. OCP: sensor 5, 500-m range.

APPENDIX B. OCP WIND MEASUREMENT COMPARISON PLOTS

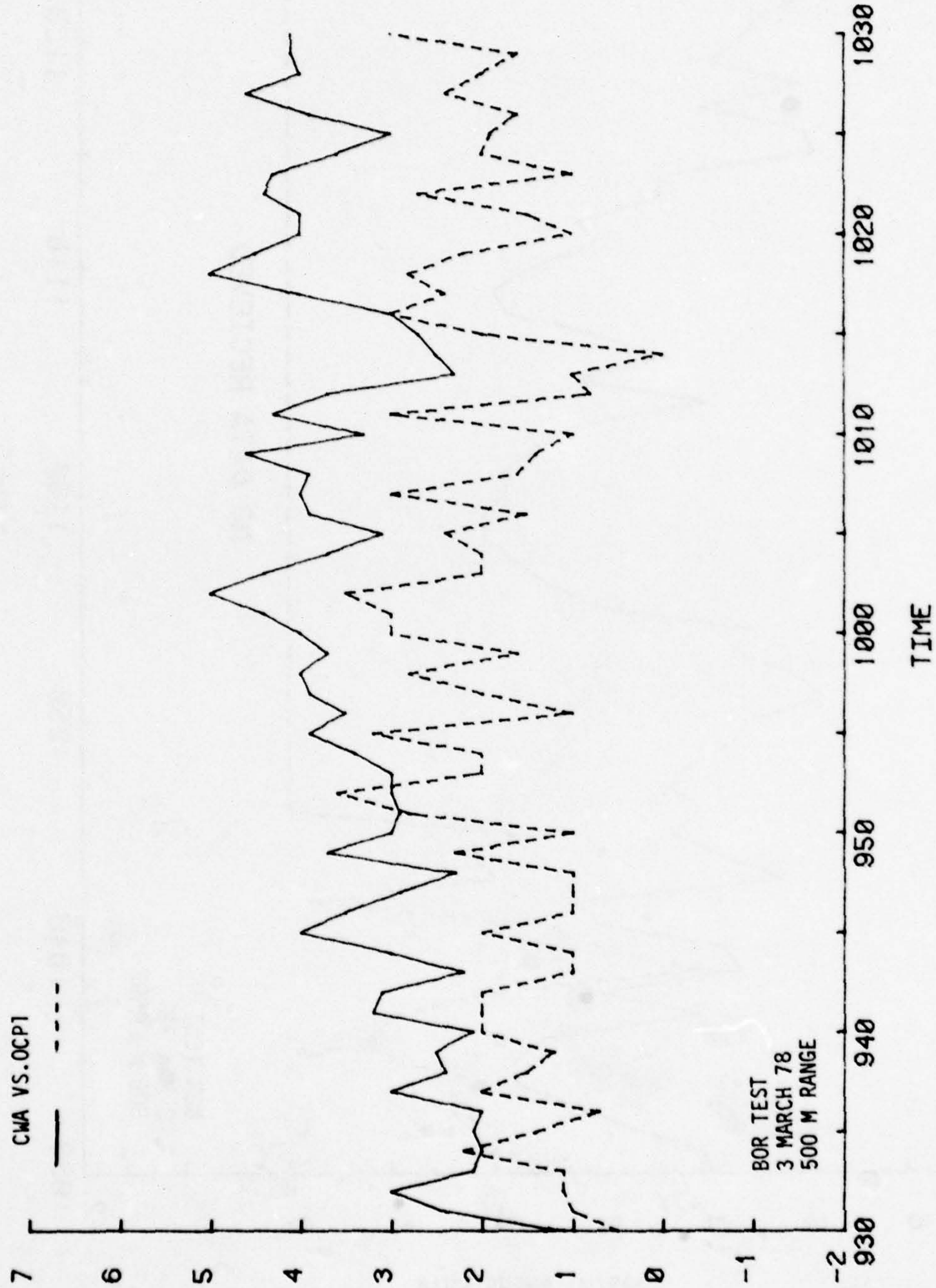

Figure B-1a. Wind comparison plot.

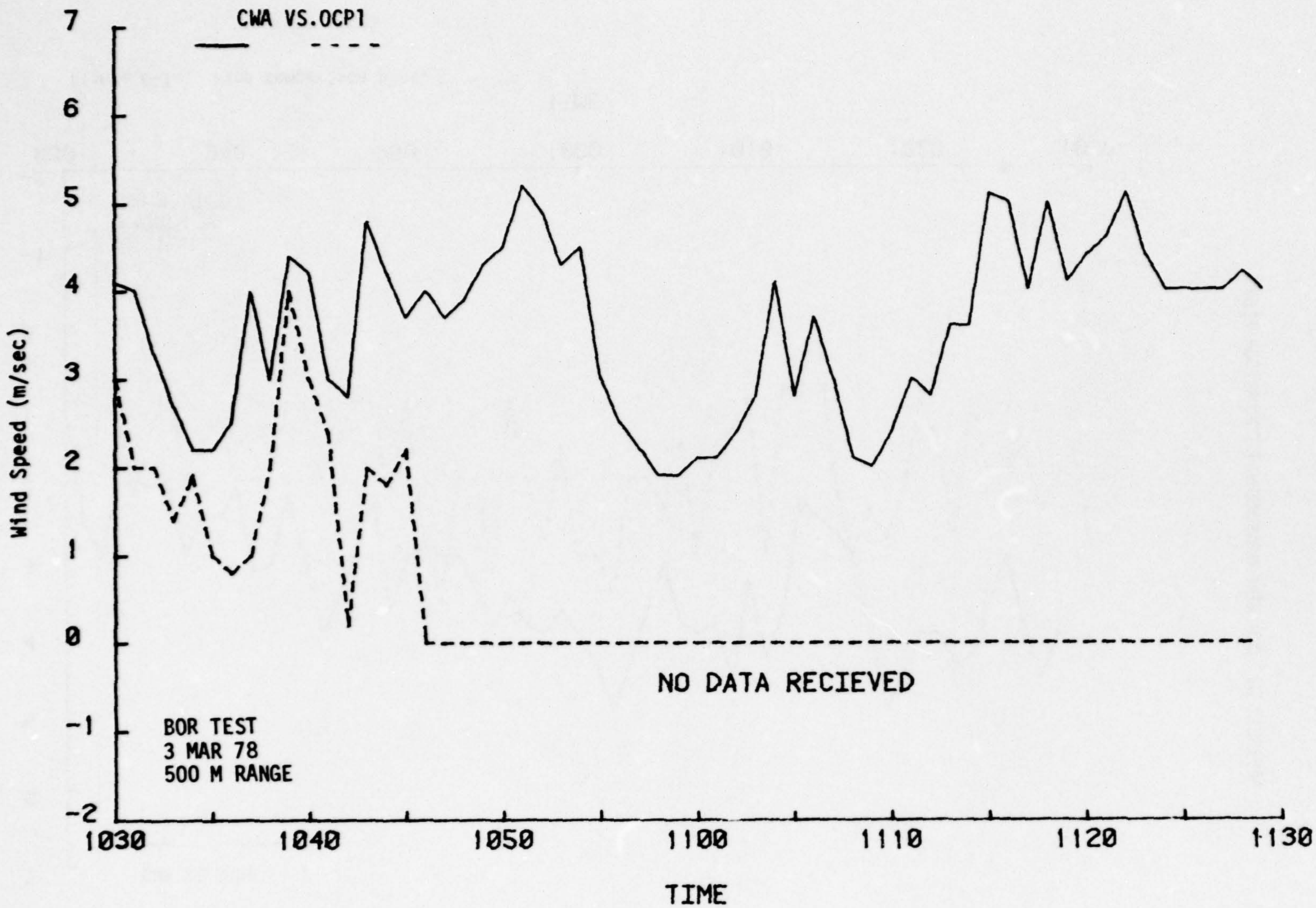

Figure B-1b. Wind comparison plot.

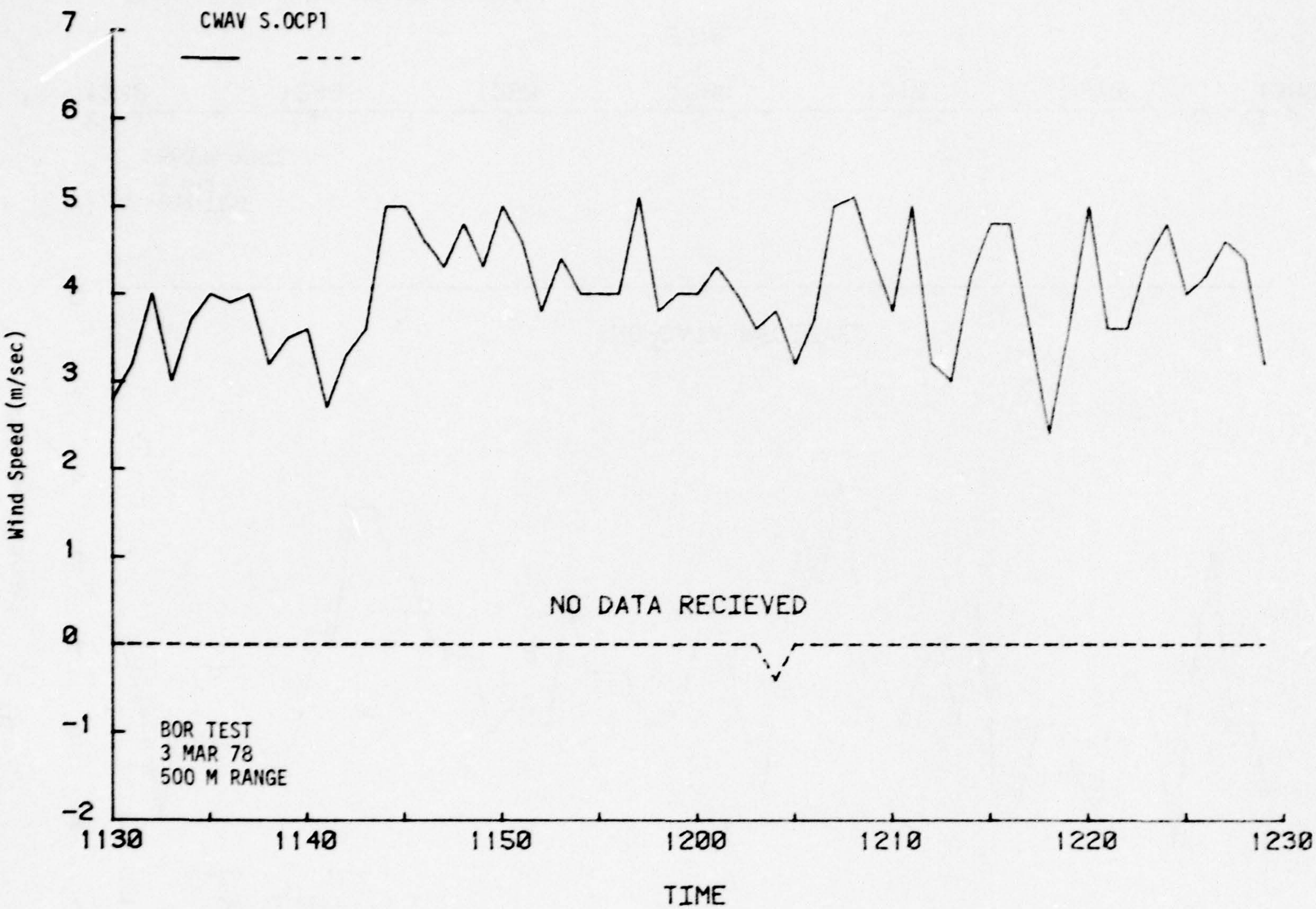

Figure B-1c. Wind comparison plot.

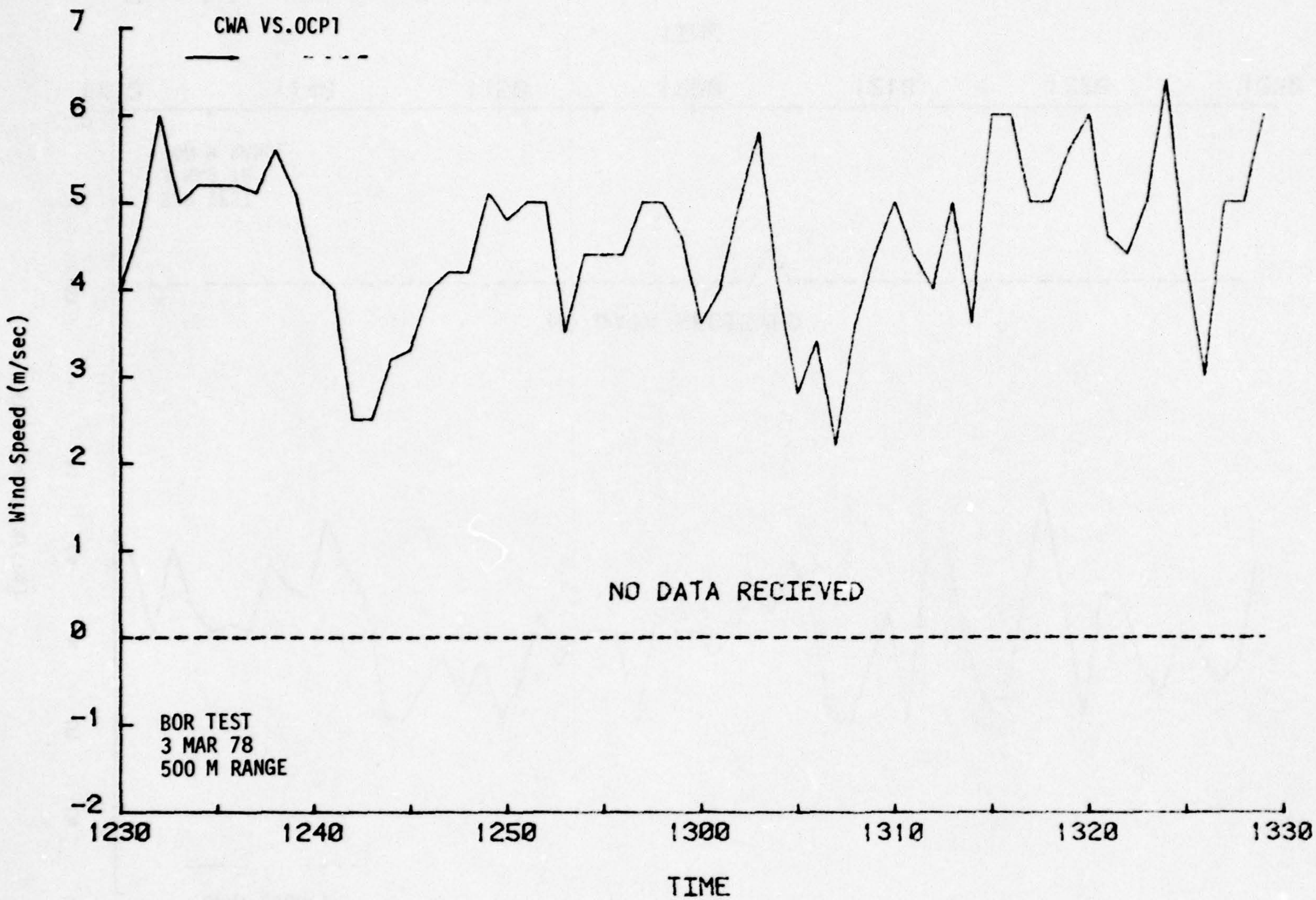

Figure B-1d. Wind comparison plot.

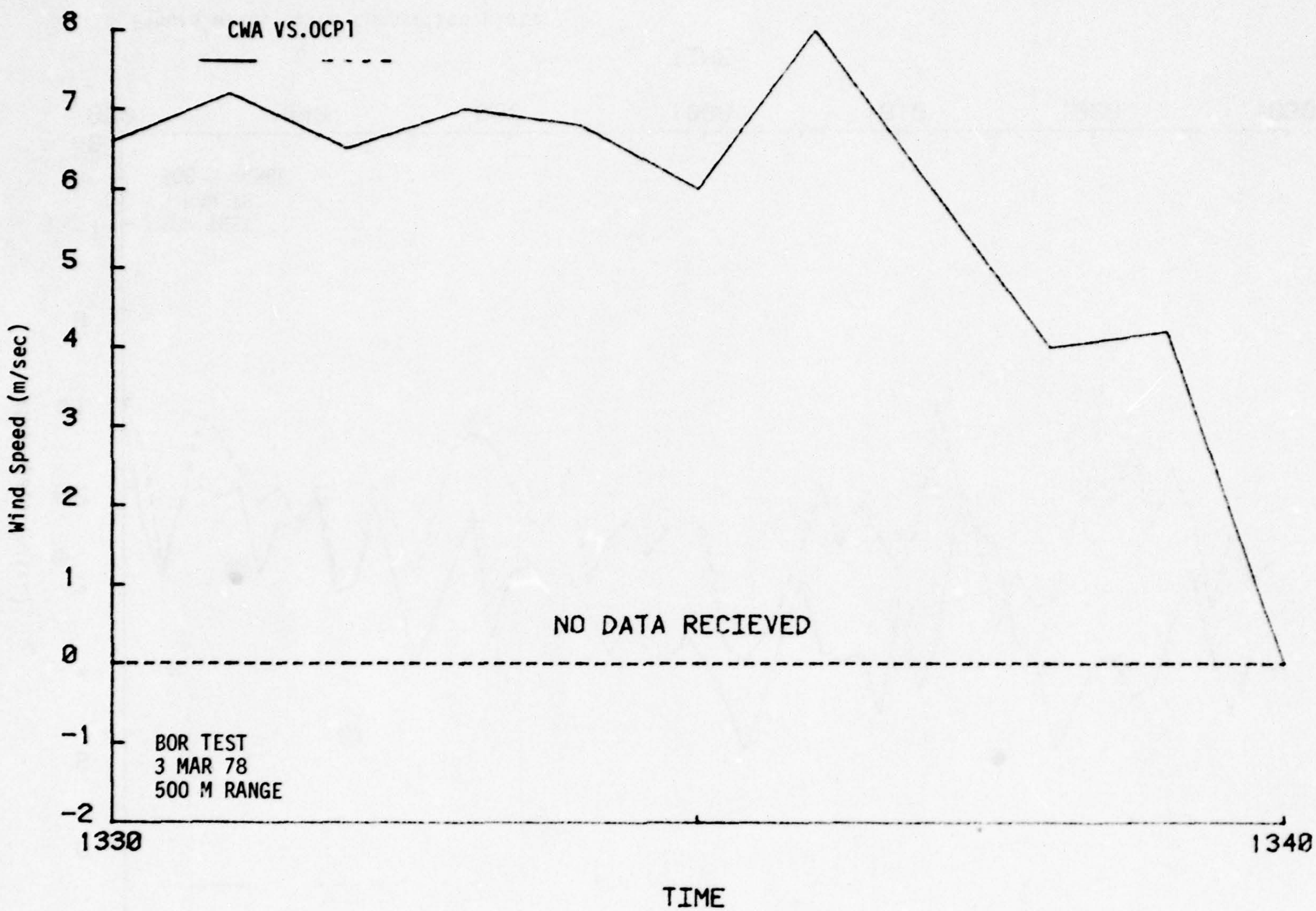

Figure B-1e. Wind comparison plot.

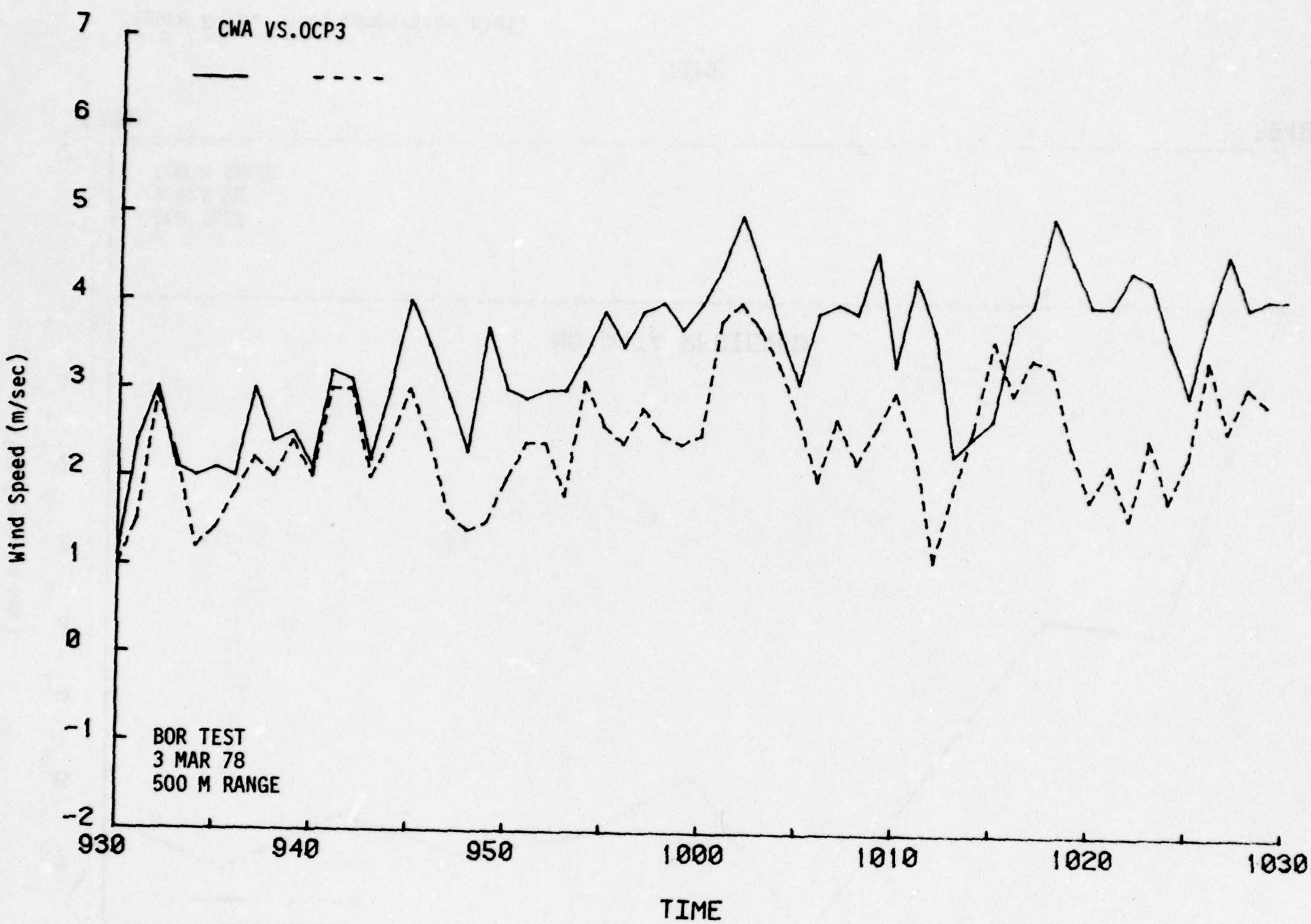

Figure B-2a. Wind comparison plot.

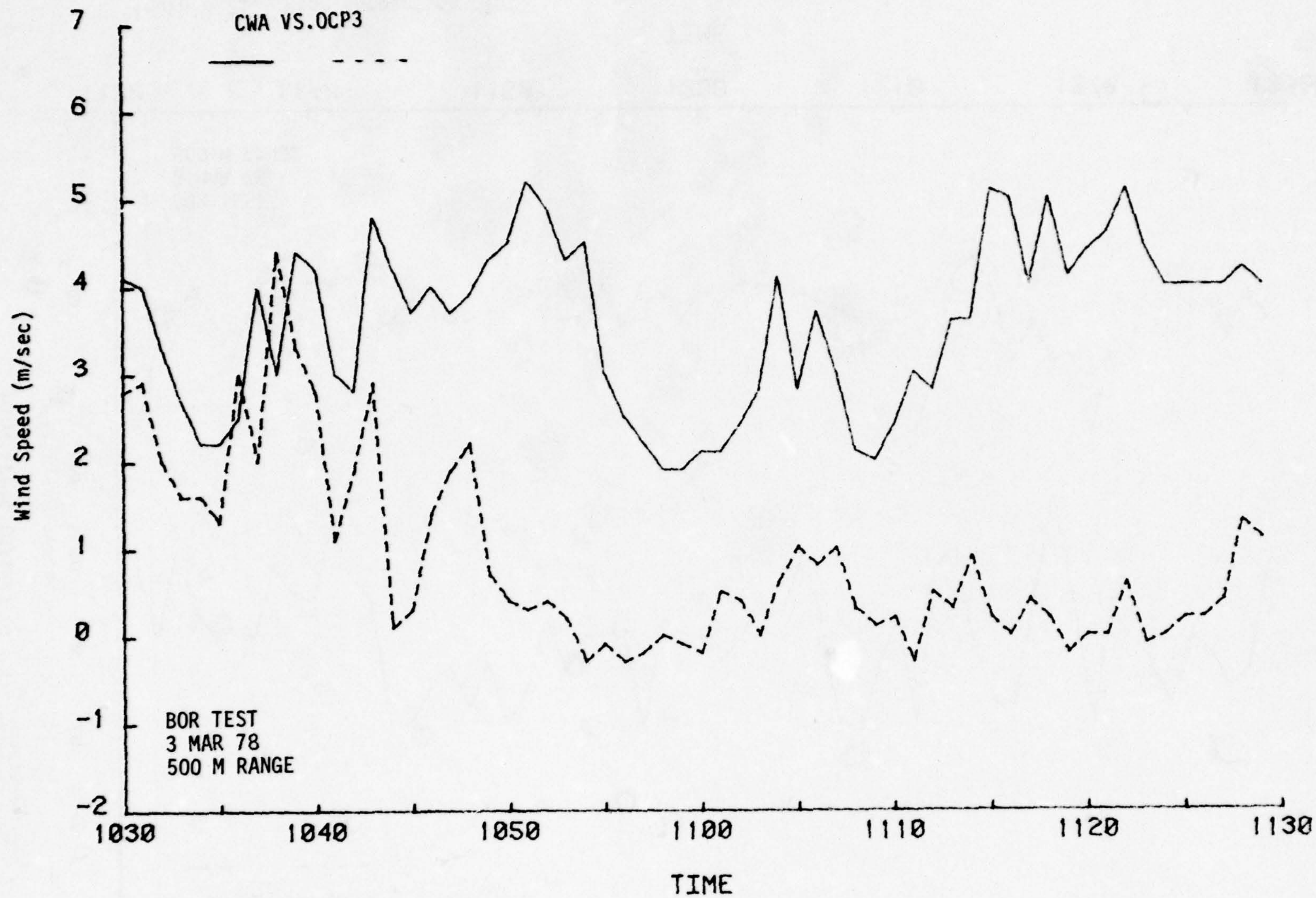

Figure B-2b. Wind comparison plot.

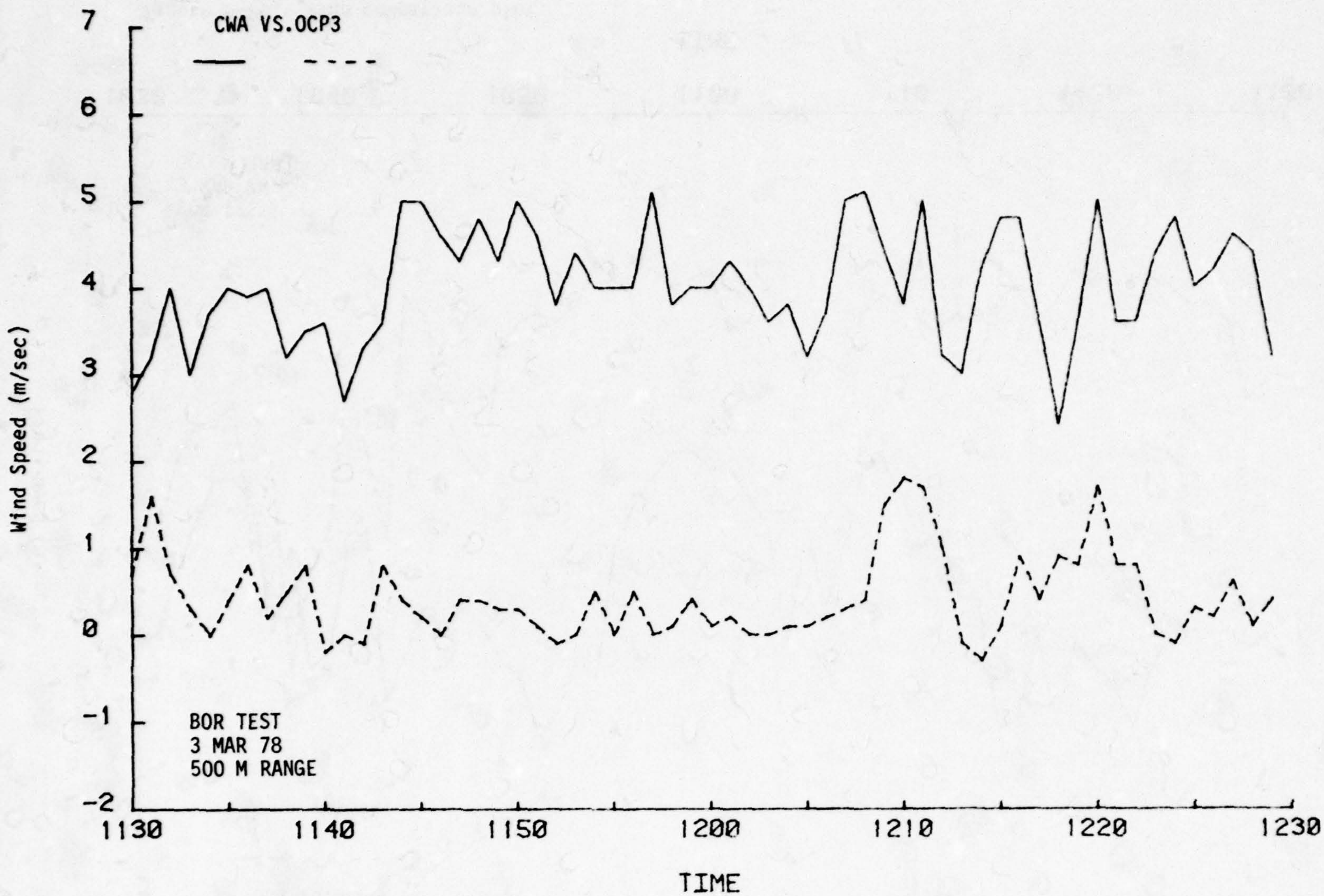

Figure B-2c. Wind comparison plot.

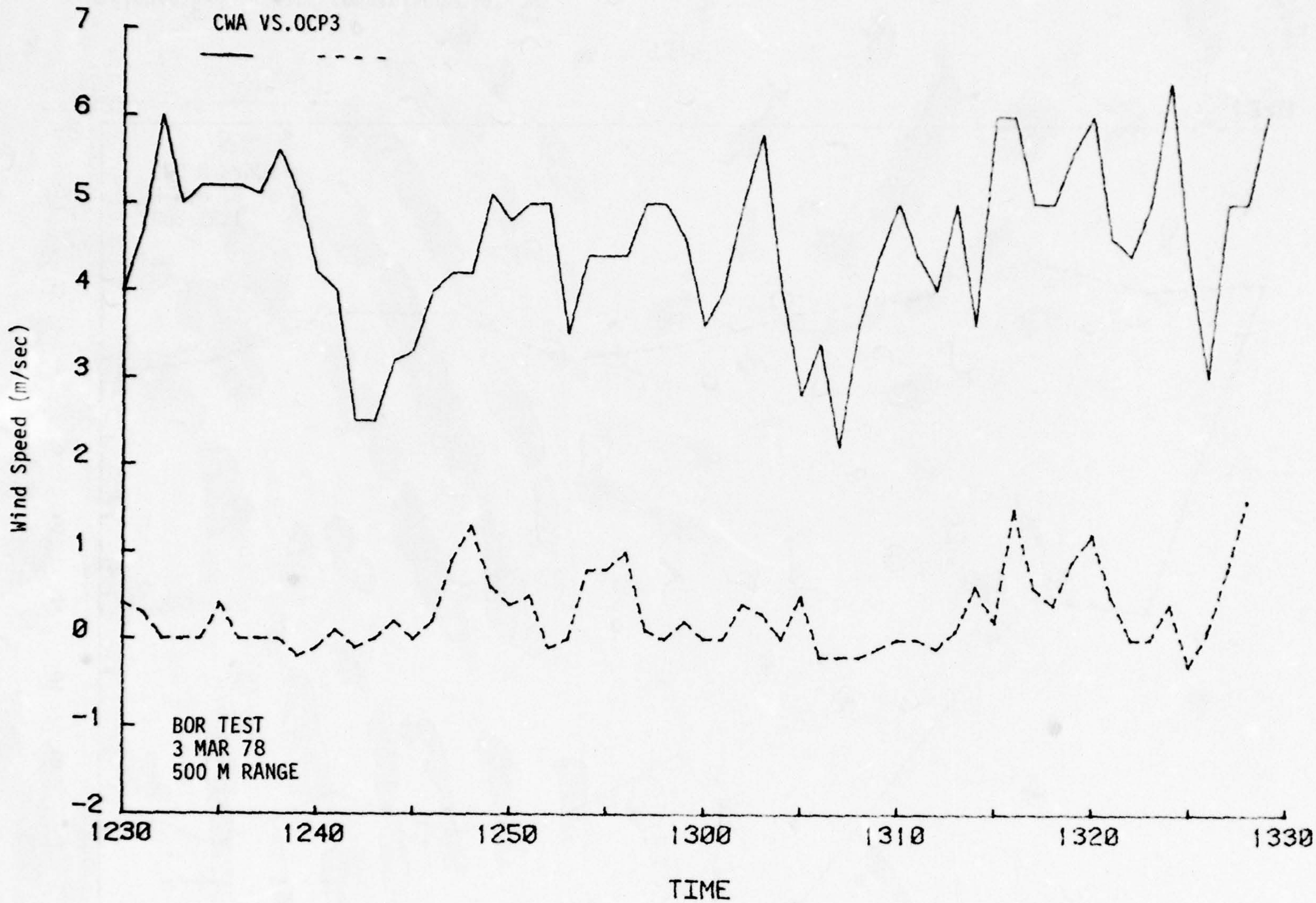

Figure B-2d. Wind comparison plot.

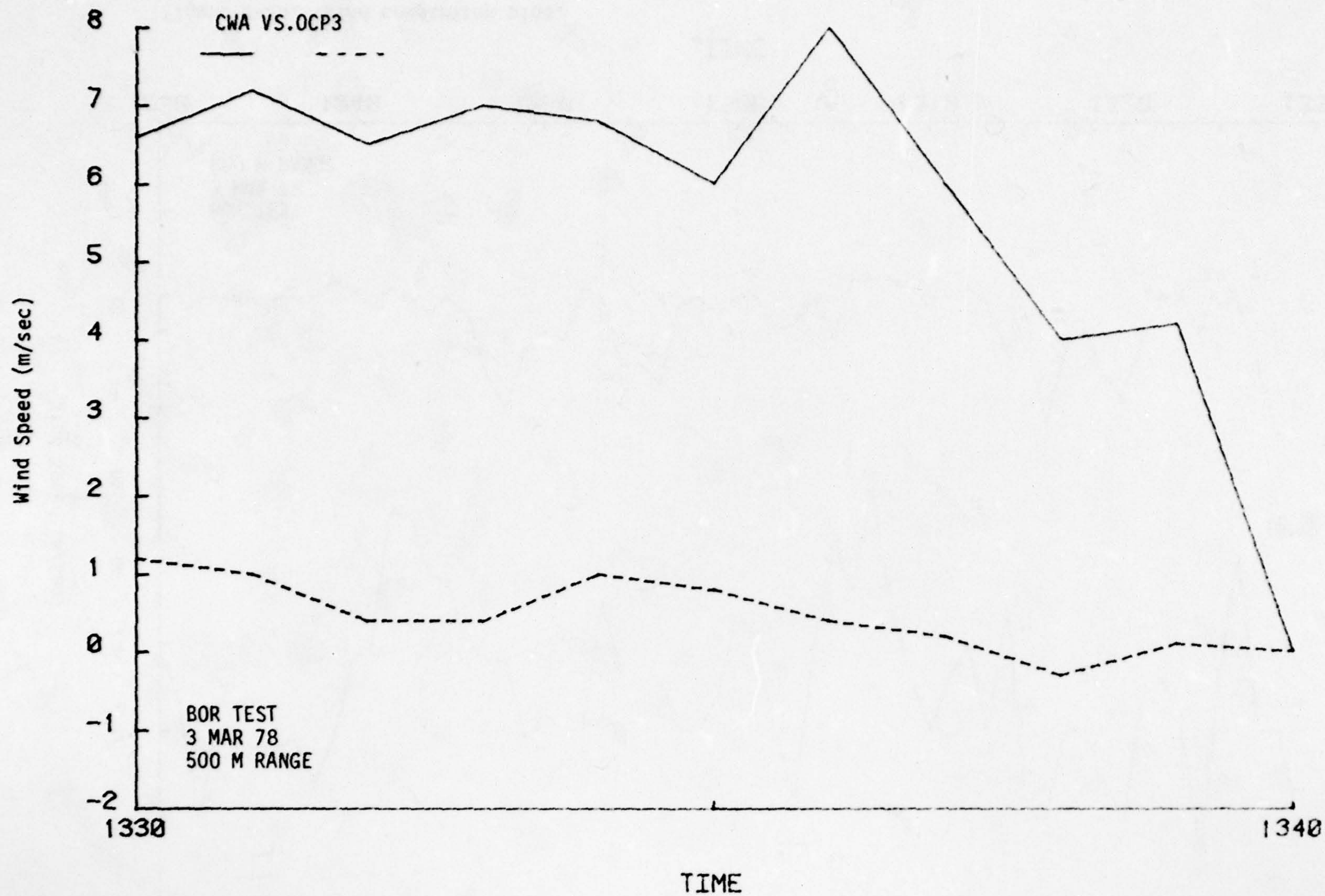

Figure B-2e. Wind comparison plot.

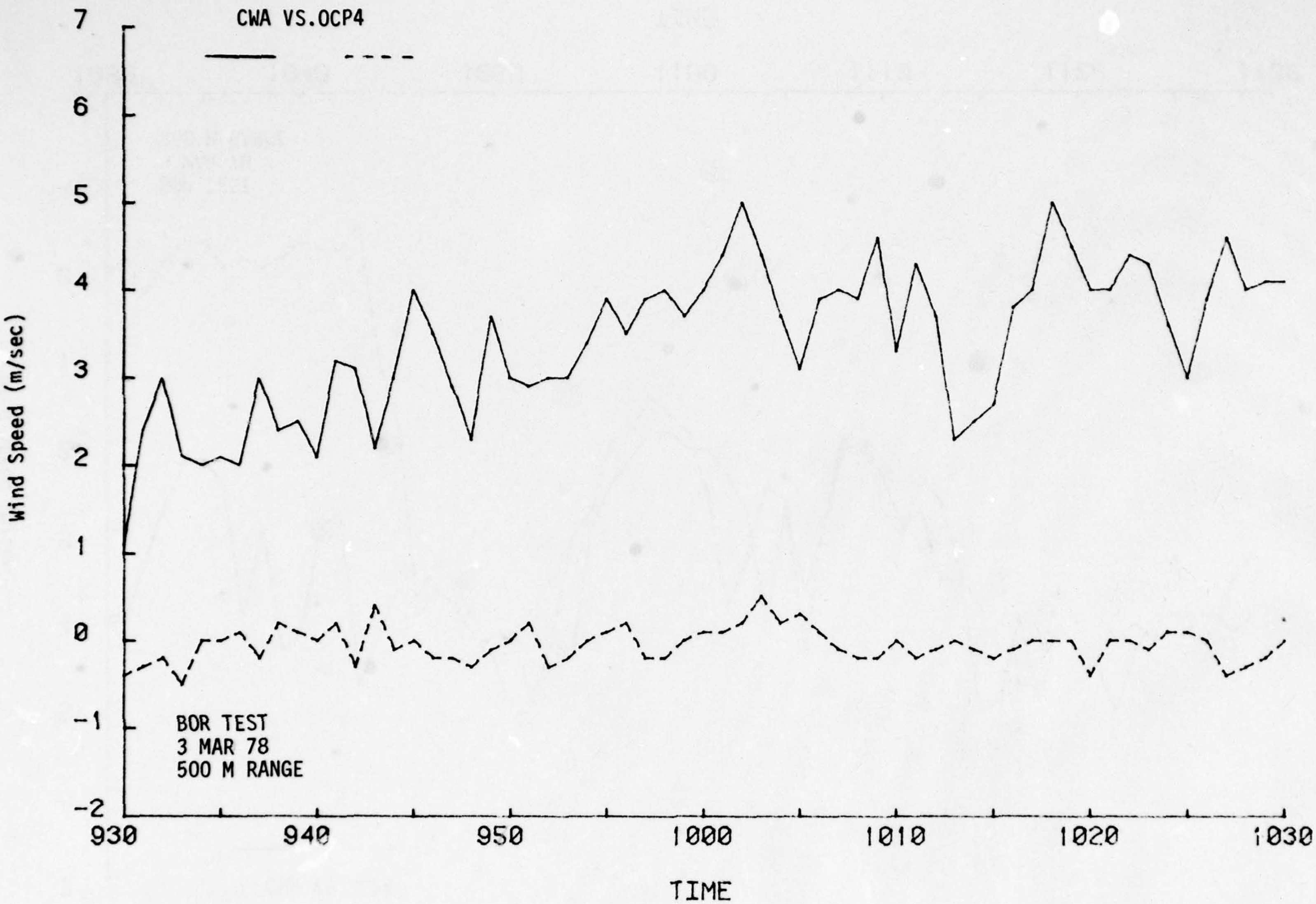

Figure B-3a. Wind comparison plot.

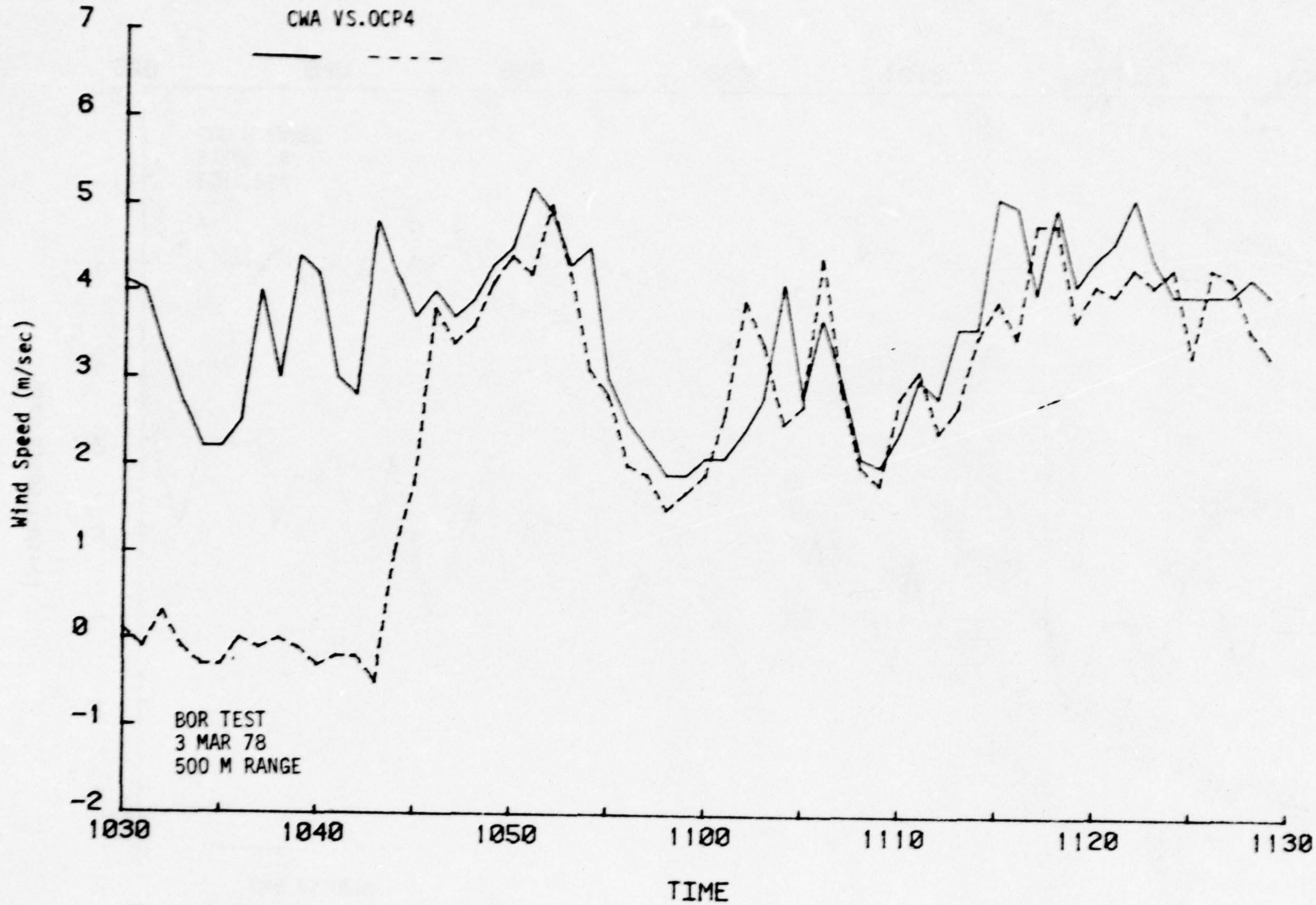

Figure B-3b. Wind comparison plot.

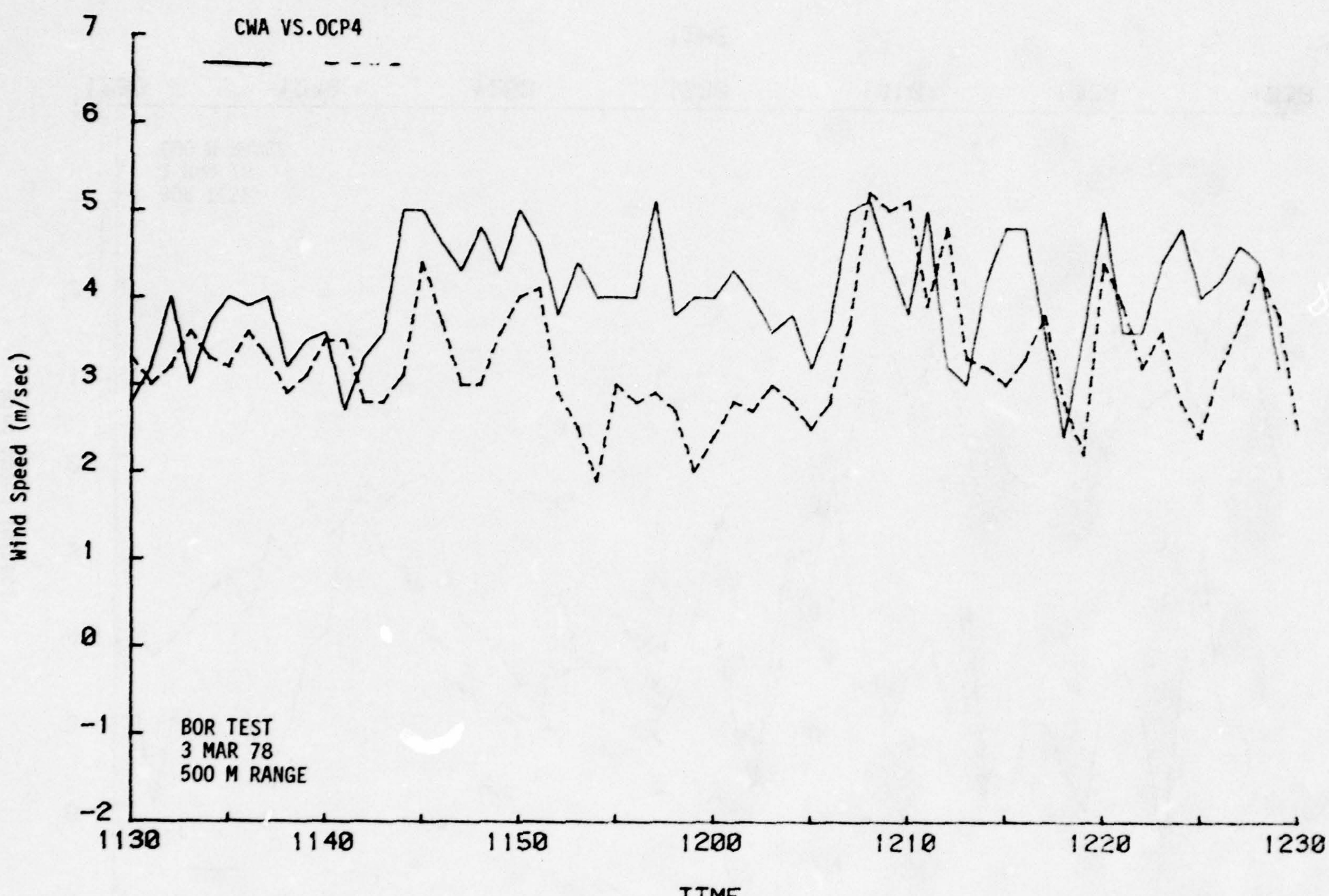

Figure B-3c. Wind comparison plot.

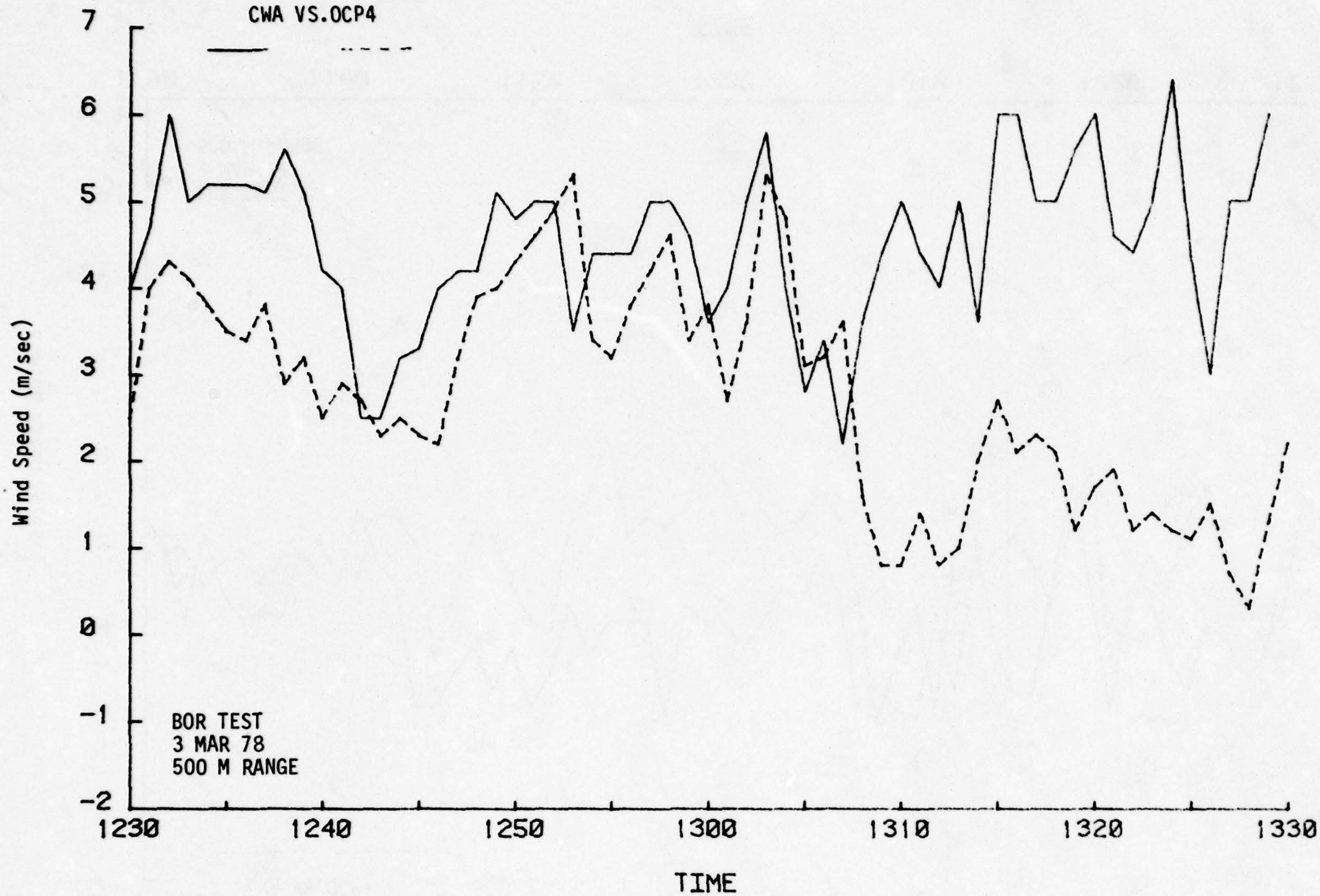

Figure B-3d. Wind comparison plot.

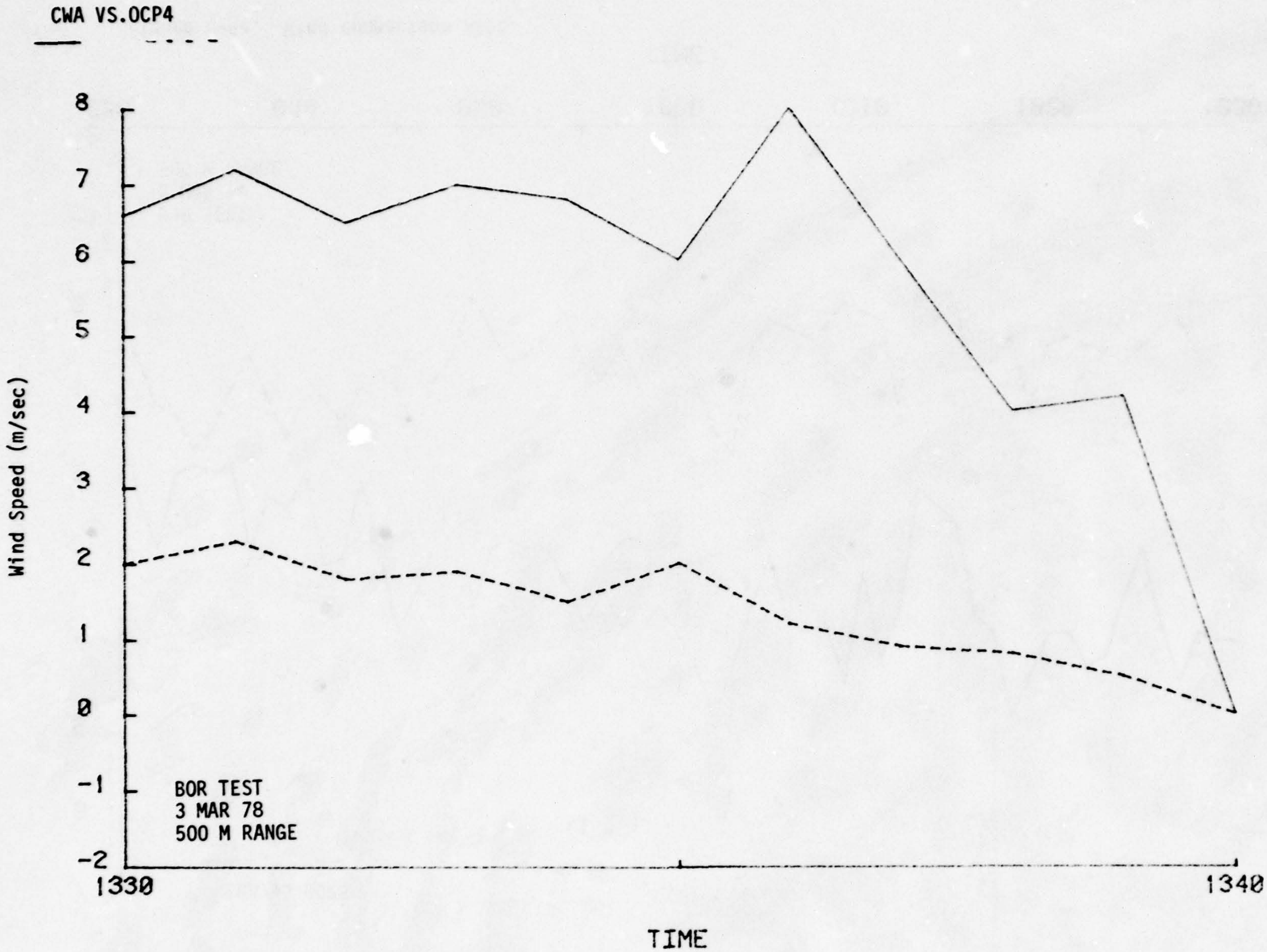

Figure B-3e. Wind comparison plot.

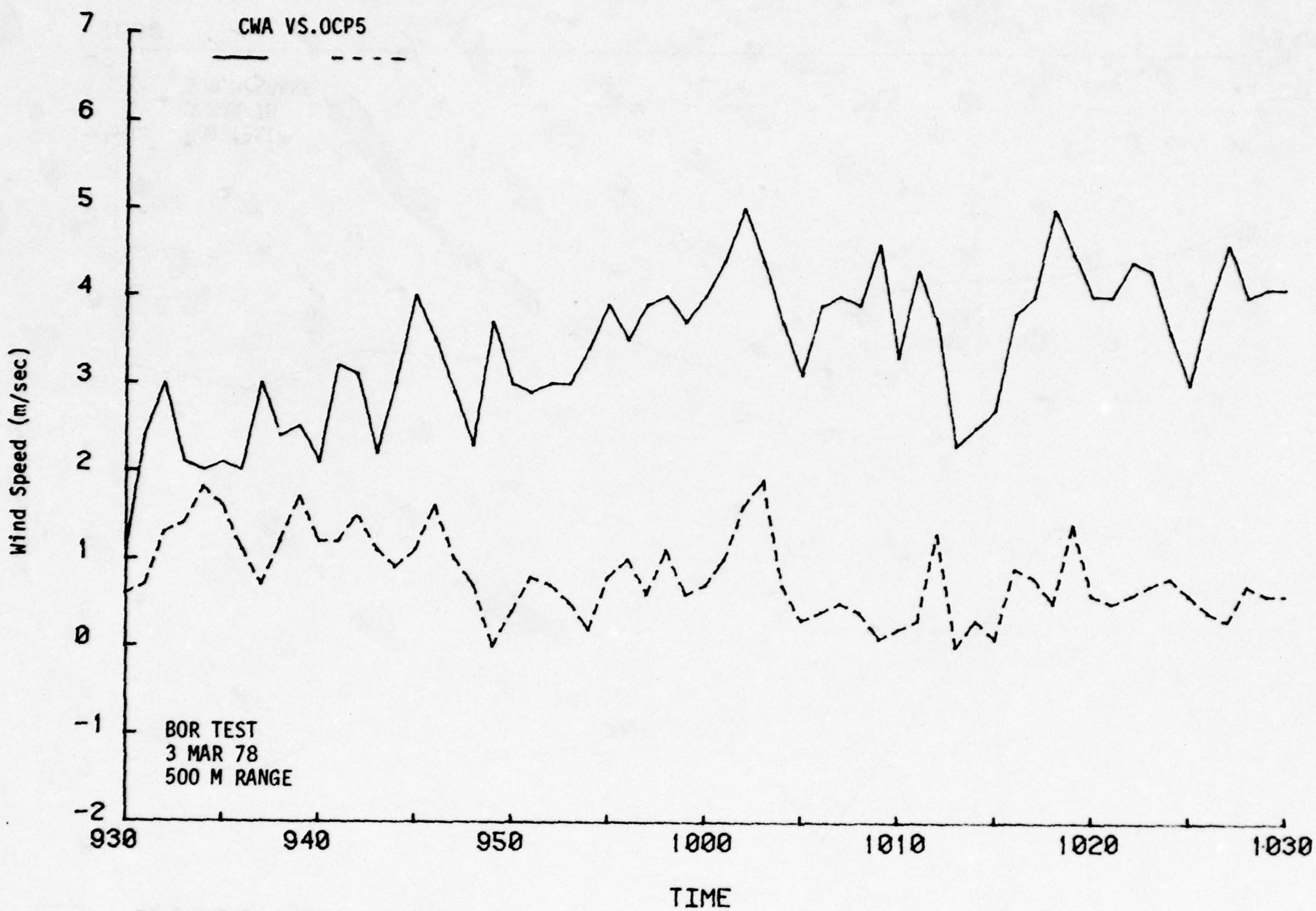

Figure B-4a. Wind comparison plot.

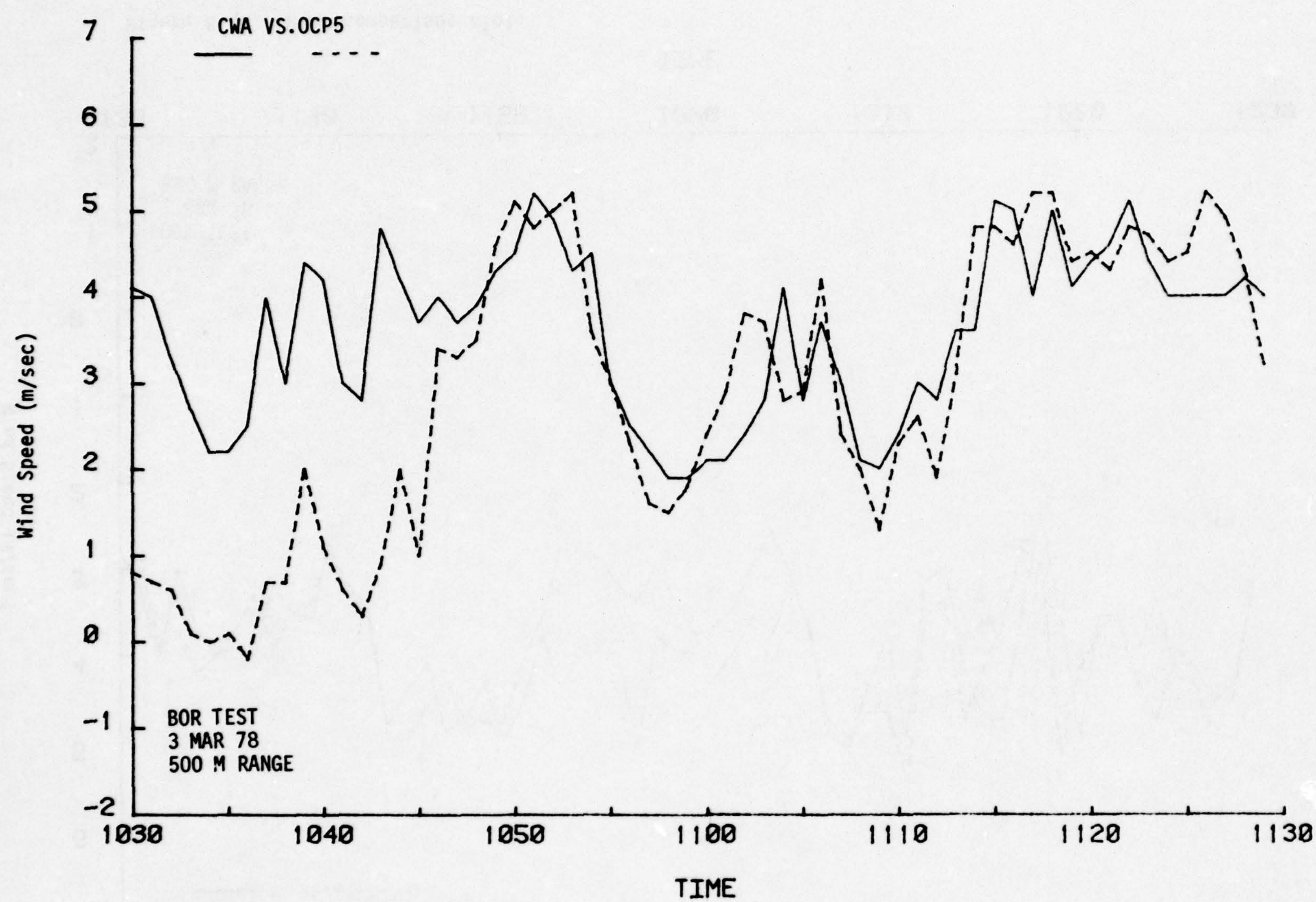

Figure B-4b. Wind comparison plot.

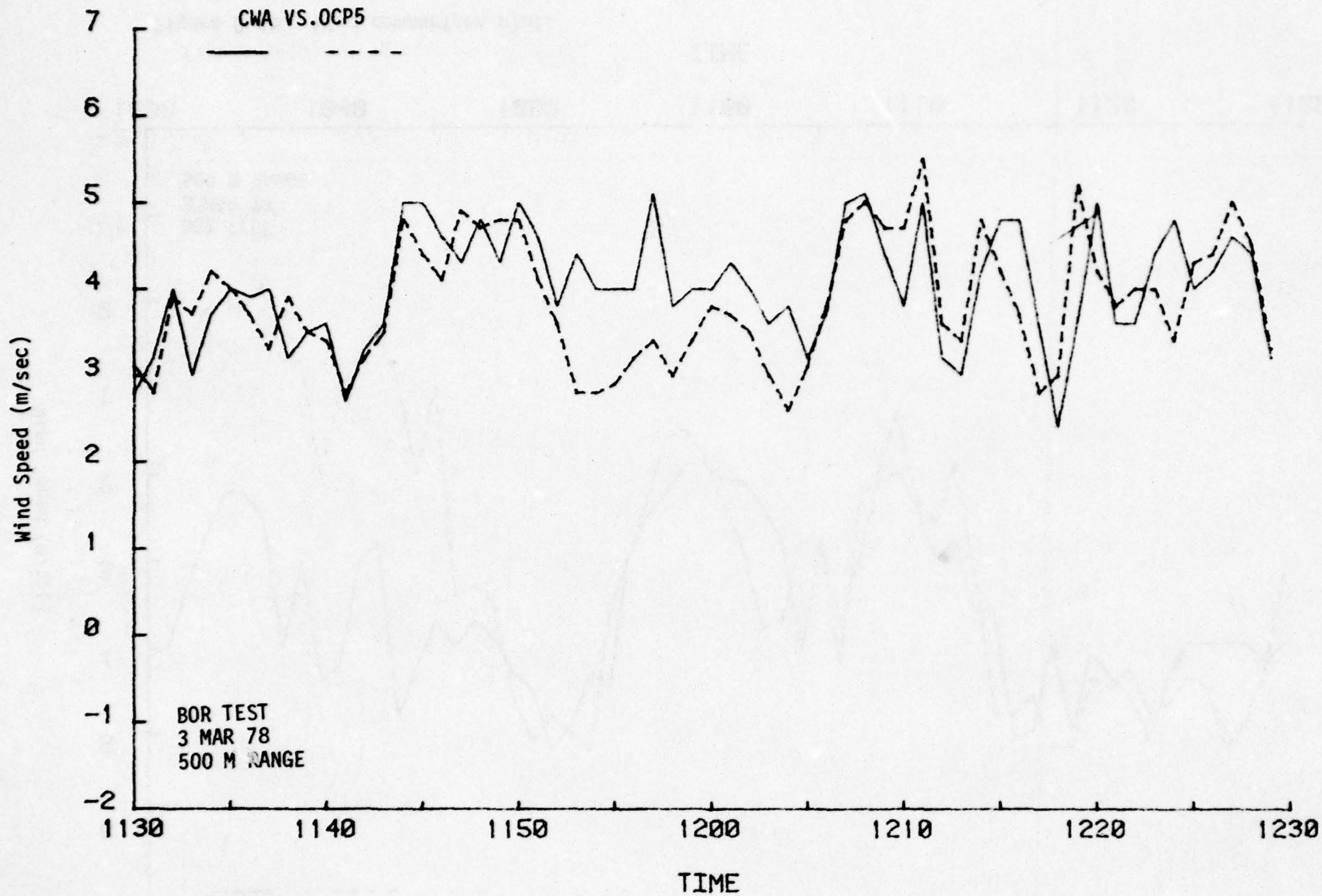

Figure B-4c. Wind comparison plot.

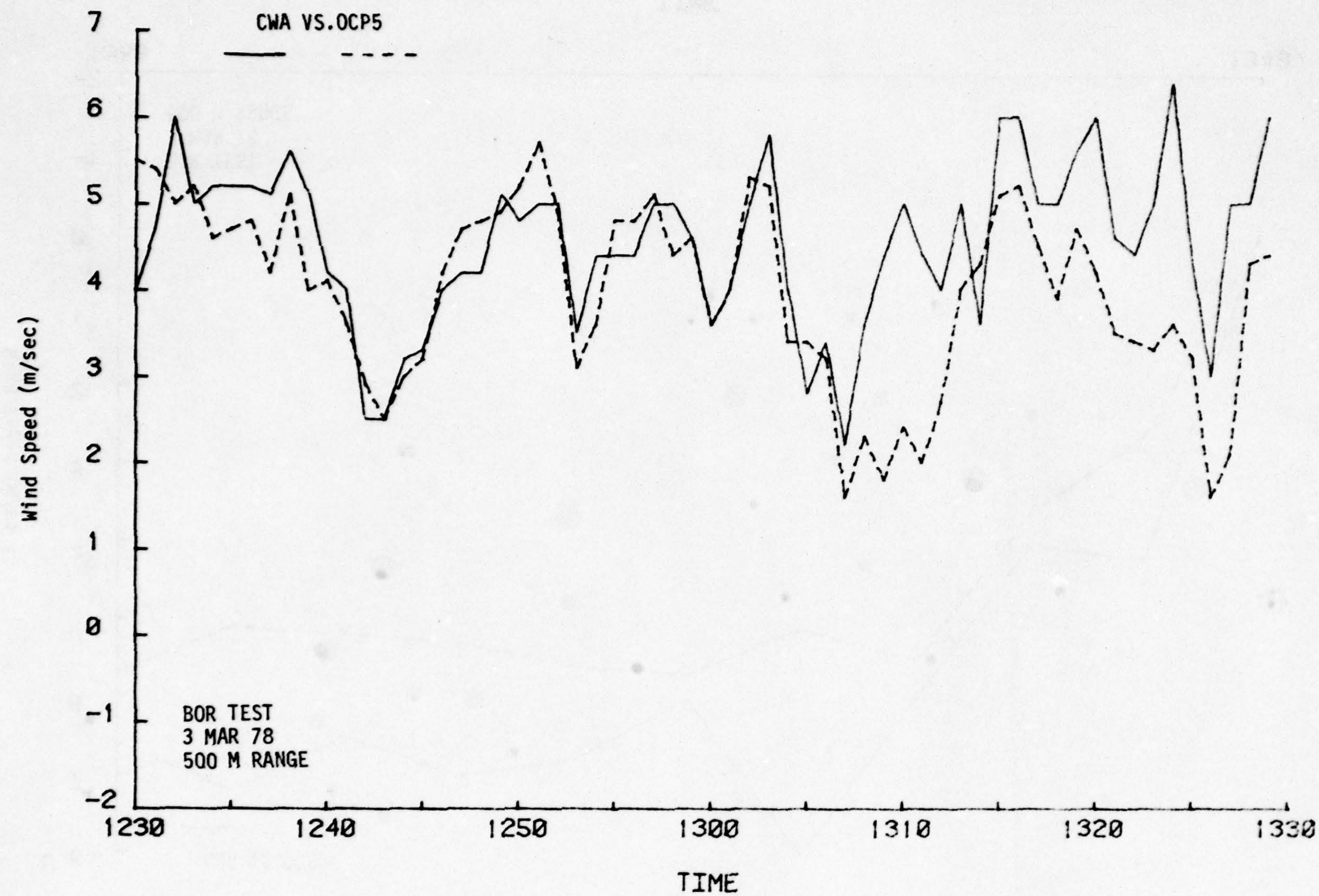

Figure B-4d. Wind comparison plot.

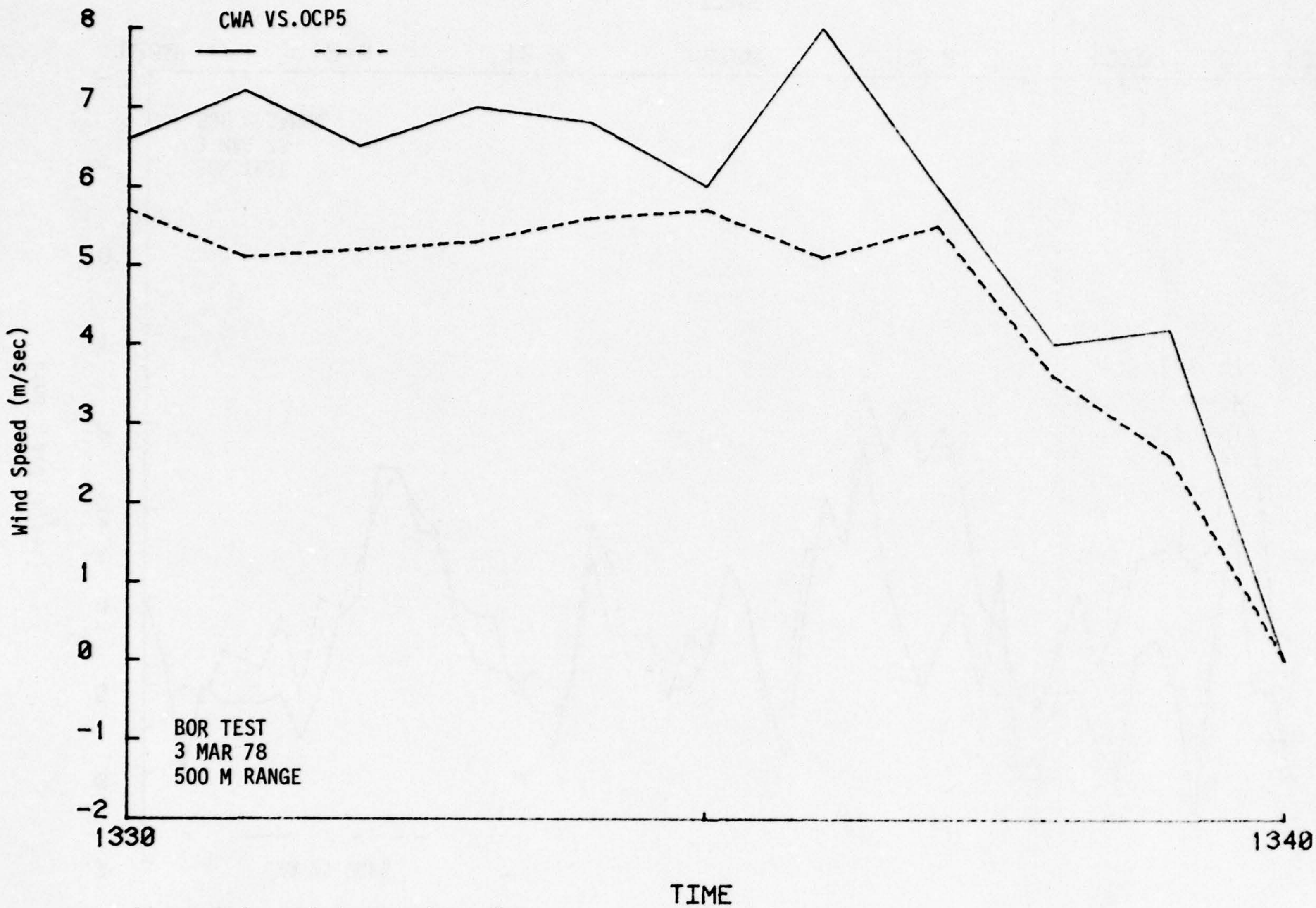

Figure B-4e. Wind comparison plot.

APPENDIX C. DAILY WEATHER PARAMETERS

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

PRELIMINARY LOCAL CLIMATOLOGICAL DATA

STATION: El Paso, International Airport, TX
MONTH: FEBRUARY
YEAR: 1978
LATITUDE: 31° 48' N
LONGITUDE: 106° 24' W
GROUND ELEVATION (ft): 3918 FT
STANDARD TIME: MTN

DAY	TEMPERATURE °F: MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	DEGREE DAYS (Base 65°): HEATING	COOLING	PRECIPITATION (In.): TOTAL (Water equivalent)	SNOWFALL, ICE PELLETS	SNOW, ICE PELLETS OR ICE ON GROUND AT 5AM	WIND: AVERAGE SPEED (m.p.h.)	FASTEST MILE: SPEED (m.p.h.)	DIRECTION	SUNSHINE: TOTAL (Hrs. and tenths)	PERCENT OF POSSIBLE	SKY COVER SUNRISE TO SUNSET (Tenths)	WEATHER OCCURRENCES	SKY MID TO MID	PK MPH	GUST DIRT	TIME
1	2	3	4	5	6a	6b	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	67	39	53	+7	12	0	0	0	0	5.7	13	28	626	98	3		1	24	W	1249
2	55	41	48	+2	17	0	T	0	0	5.8	9	10	571	89	4		4	17	NE	0803
3	64	37	51	+5	14	0	0	0	0	5.0	10	02	644	100	0		1	15	NE	1203
4	72	33	53	+7	12	0	0	0	0	7.2	17	04	627	97	4		4	23	NE	1649
5	63	35	49	+2	16	0	0	0	0	4.5	13	13	446	69	9		8	16	SE	1639
6	53	44	49	+2	16	0	.27	0	0	6.2	15	22	36	6	10	1	8	24	W	1833
7	62	46	54	+7	11	0	0	0	0	9.8	18	22	545	84	5		5	25	SW	0438
8	62	46	54	+7	11	0	.03	0	0	14.6	29	26	331	51	6		5	45	W	2019
9	63	37	50	+3	15	0	0	0	0	6.0	22	28	632	97	2		1	28	W	0004
10	74	37	56	+8	9	0	0	0	0	4.8	12	14	593	90	3		3	23	SW	1354
11	57	43	50	+2	15	0	.04	0	0	9.6	24	25	605	9	10		7	35	W	1248
12	51	39	45	-3	20	0	0	0	0	11.7	22	25	430	65	5		7	43	W	1418
13	53	39	46	-2	19	0	0	0	0	10.5	25	25	593	90	6		6	39	W	0457
14	53	41	47	-1	18	0	.02	0	0	10.4	21	26	367	55	7		7	40	W	2122
15	54	33	44	-4	21	0	0	0	0	7.1	21	26	593	89	2		3	29	SW	0012
16	55	35	45	-4	20	0	0	0	0	14.7	28	30	466	70	5		3	44	NW	1956
17	45	25	35	-13	30	0	0	0	0	3.2	12	01	474	71	7		4	17	N	0057
18	48	28	38	-11	27	0	0	0	0	3.4	14	25	645	96	2		1	17	N	1306
19	47	27	37	-12	28	0	0	0	0	7.6	14	02	556	83	5		4	30	NE	1411
20	57	28	43	-6	22	0	0	0	0	6.6	13	23	673	100	0		0	21	SW	0254
21	58	28	43	-7	22	0	0	0	0	3.9	7	06	675	100	0		0	13	SE	1457
22	63	29	46	-4	19	0	0	0	0	3.1	9	01	649	96	9		7	12	SW	1306
23	68	31	50	0	15	0	0	0	0	3.1	7	20	666	98	6		4	15	NE	0217
24	71	32	52	+2	13	0	0	0	0	7.7	18	29	680	100	0		0	29	NW	1702
25	73	35	54	+4	11	0	0	0	0	6.0	13	23	682	100	1		0	23	SW	1614
26	74	44	59	+8	6	0	T	0	0	8.2	17	22	3	0	10		9	30	SW	2236
27	65	50	58	+7	7	0	.06	0	0	9.9	18	24	234	34	8		8	31	SW	0002
28	73	50	62	+11	3	0	.05	0	0	9.9	16	22	310	45	8	1	9	29	SW	1340
29																				
30																				
31																				
SUM	1700	1032	—	—	449	0	.47	0	—	206.2	—	—	13807	---	137	—	119	45	W	2019
AVG	60.7	36.9	—	—	—	—	—	—	—	7.4	FASTEST	DIRECTION	POSSIBLE	%		—				
										MISC. →	29	26	18583	74	4.9	—	4.3			

TEMPERATURE DATA

AVERAGE MONTHLY 48.8
DEPARTURE FROM NORMAL +0.4
HIGHEST 74 ON 10th, 26th
LOWEST 25 ON 17th
NUMBER OF DAYS WITH –
MAX. 32° OR BELOW 0
MAX. 90° OR ABOVE 0
MIN. 32° OR BELOW 8
MIN. 0° OR BELOW 0
HEATING DEGREE DAYS (Base 65°)
TOTAL THIS MONTH 449
DEPARTURE FROM NORMAL -16
SEASONAL TOTAL 1908
DEPARTURE FROM NORMAL -353
COOLING DEGREE DAYS (Base 65°)
TOTAL THIS MONTH 0
DEPARTURE FROM NORMAL 0
SEASONAL TOTAL 0
DEPARTURE FROM NORMAL 0

PRECIPITATION DATA

TOTAL FOR THE MONTH .47 IN.
DEPARTURE FROM NORMAL +.05 IN.
GREATEST IN 24 HRS .27 ON 6th
SNOWFALL, ICE PELLETS
TOTAL FOR THE MONTH 0 IN.
GREATEST IN 24 HRS 0 ON –
GREATEST DEPTH ON GROUND 0 ON –

WEATHER

NUMBER OF DAYS –
CLEAR (Scale 0–3) 10
PARTLY CLOUDY (Scale 4–7) 11
CLOUDY (Scale 8–10) 7
WITH 0.01 INCH OR MORE PRECIP. 6
WITH 0.10 INCH OR MORE PRECIP. 1
WITH 0.50 INCH OR MORE PRECIP. 0
WITH 1.00 INCH OR MORE PRECIP. 0

SYMBOLS USED IN COLUMN 16

1 = FOG
2 = FOG WITH VISIBILITY 1/4 MILE OR LESS
3 = THUNDER
4 = ICE PELLETS
5 = HAIL
6 = GLAZE OR RIME
7 = DUSTSTORM OR SANDSTORM
8 = SMOKE OR HAZE
9 = BLOWING SNOW
$\overline{\text{X}}$ = TORNADO

MAXIMUM PRECIPITATION

Δt (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
PRECIPITATION (Inches)	.02	.03	.04	.04	.05	.06	.08	.10	.11	.14	.16	.20
ENDED: DATE	27	06	06	06	06	06	06	06	06	06	06	06
TIME	2312	1200	1200	1200	1200	1200	1200	1220	1220	1200	1200	1300

BAROMETRIC PRESSURE

MONTHLY AVERAGE STATION
HIGHEST SEA-LEVEL 30.40 ON 21st
LOWEST SEA-LEVEL 29.46 ON 11th

WS FORM F-6 (9-74)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

PRELIMINARY LOCAL CLIMATOLOGICAL DATA

STATION: El Paso, International Airport, TX

MONTH: MARCH YEAR: 1978

LATITUDE: 31° 48' N LONGITUDE: 106° 24' W GROUND ELEVATION (ft): 3918 FT STANDARD TIME: MTN

DAY (1)	Temperature °F: Maximum (2)	Minimum (3)	Average (4)	Departure from normal (5)	Degree days (Base 65°): Heating (6a)	Cooling (6b)	Precipitation (In.): Total (Water equivalent) (7)	Snowfall, ice pellets (8)	Snow, ice pellets or ice on ground at 5AM (9)	Wind: Average speed (m.p.h.) (10)	Fastest mile: Speed (m.p.h.) (11)	Direction (12)	Sunshine: Total (Hrs. and tenths) (13)	Percent of possible (14)	Sky cover sunrise to sunset (Tenths) (15)	Weather occurrences (16)	SKY MID TO MID (17)	PK MPH (18)	GUST DIRT (19)	TIME (20)
1	68	52	60	+9	5	0	.07	0	0	12.2	30	25	153	22	9		8	49	W	2054
2	70	52	61	+10	4	0	T	0	0	12.8	30	23	330	48	8		7	41	SW	0156
3	70	52	61	+10	4	0	0	0	0	18.5	29	28	601	87	5		4	41	SW	1031
4	67	33	50	-2	15	0	0	0	0	7.8	14	20	667	96	4		2	18	W	0348
5	77	51	64	+12	1	0	T	0	0	14.3	29	26	528	76	8		6	49	SW	2302
6	65	47	56	+4	9	0	T	T*	0	13.4	23	23	483	69	8	5	7	37	SW	0113
7	55	35	45	-7	20	0	T	0	0	6.0	27	28	285	41	7		5	30	W	0001
8	69	30	50	-2	15	0	0	0	0	6.0	15	24	704	100	0		0	21	SW	1021
9	77	37	57	+4	8	0	0	0	0	7.0	15	23	684	97	2		2	23	SW	0133
10	68	47	58	+5	7	0	0	0	0	18.6	35	26	666	94	3		2	62	SW	1258
11	66	44	55	+2	10	0	0	0	0	10.3	21	29	710	100	0		0	32	W	0016
12	65	35	50	-3	15	0	T	0	0	12.4	29	26	410	58	6		5	46	SW	1807
13	59	42	51	-3	14	0	0	0	0	17.2	25	27	540	76	4		4	40	W	2154
14	65	40	53	-1	12	0	0	0	0	15.1	23	27	716	100	0		0	35	W	1925
15																				
16																				
17																				
18																				
19																				
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25																				
26																				
27																				
28																				
29																				
30																				
31																				
SUM																				
AVG											FASTEST	DIRECTION	POSSIBLE	%						
										MISC. →										

TEMPERATURE DATA	PRECIPITATION DATA	WEATHER	SYMBOLS USED IN COLUMN 16
AVERAGE MONTHLY ____	TOTAL FOR THE MONTH ____ IN	NUMBER OF DAYS –	1 = FOG
DEPARTURE FROM NORMAL ____	DEPARTURE FROM NORMAL ____ IN	CLEAR (Scale 0–3) ____	2 = FOG WITH VISIBILITY ¼ MILE OR LESS
HIGHEST ____ ON ____	GREATEST IN 24 HRS. ____ ON ____	PARTLY CLOUDY (Scale 4–7) ____	3 = THUNDER
LOWEST ____ ON ____	SNOWFALL, ICE PELLETS	CLOUDY (Scale 8–10) ____	4 = ICE PELLETS
NUMBER OF DAYS WITH –	TOTAL FOR THE MONTH ____ IN	WITH 0.01 INCH OR MORE PRECIP. ____	5 = HAIL
MAX. 32° OR BELOW ____	GREATEST IN 24 HRS. ____ ON ____	WITH 0.10 INCH OR MORE PRECIP. ____	6 = GLAZE OR RIME
MAX. 90° OR ABOVE ____	GREATEST DEPTH ON GROUND ____ ON ____	WITH 0.50 INCH OR MORE PRECIP. ____	7 = DUSTSTORM OR SANDSTORM
MIN. 32° OR BELOW ____		WITH 1.00 INCH OR MORE PRECIP. ____	8 = SMOKE OR HAZE
MIN. 0° OR BELOW ____			9 = BLOWING SNOW
HEATING DEGREE DAYS (Base 65°)			X = TORNADO
TOTAL THIS MONTH ____			
DEPARTURE FROM NORMAL ____			
SEASONAL TOTAL ____			
DEPARTURE FROM NORMAL ____			
COOLING DEGREE DAYS (Base 65°)			
TOTAL THIS MONTH ____			
DEPARTURE FROM NORMAL ____			
SEASONAL TOTAL ____			
DEPARTURE FROM NORMAL ____			

MAXIMUM PRECIPITATION

Δt (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
PRECIPITATION (Inches)												
ENDED: DATE												
TIME												

BAROMETRIC PRESSURE (Climatological station elevation)

*T-Hail

MEAN ____ FT. M.S.L.

MONTHLY AVERAGE STATION ____ IN.

HIGHEST SEA-LEVEL ____ IN. ON ____

LOWEST SEA-LEVEL ____ IN. ON ____

APPENDIX D. FORTRAN IV DATA PLOT PROGRAMS

```
&WLTMC T=00004 IS ON CR00002 USING 00020 BLKS R=0146

FTN4,L
      PROGRAM WLTMC,3
C*******************************************************************
C     WLTMC IS USED TO LOAD COMMON WITH THE DESIRED
C     PARAMETERS FOR MAG TAPE ANALYSIS WITH WLTMG.
C*******************************************************************
      COMMON F,S(22),IT(6)
      COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
      COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
      COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
      COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
      COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
      COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
      COMMON P,NB,MN,IS,MS,IARRY
      COMMON IW1,IW2,IW3,IW4,IW5,IWZ
      COMMON WT(21)
      COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
      DIMENSION IP(5)
      CALL RMPAR(IP)
      LU1=IP(1)
      LU2=IP(2)
      LU3=IP(3)
      LP=IP(4)
      IF(LU1.EQ.0)LU1=1
      IF(LU2.EQ.0)LU2=1
      IF(LU3.EQ.0)LU3=1
      IF(LP.EQ.0)LP=1
C     ZERO OUT ARRAYS
      DO 1 I=1,11
      DO 1 J=1,11
      A2(I,J)=0.0
      B2(I)=0.0
      XP2(I)=0.0
      NS2(I)=0
      BA2(I)=0.0
      IF(I.GT.8.OR.J.GT.8)GO TO 1
      A3(I,J)=0.0
      B3(I)=0.0
      XP3(I)=0.0
      NS3(I)=0
      BA3(I)=0.0
      IF(I.GT.6.OR.J.GT.6)GO TO 1
      A4(I,J)=0.0
      B4(I)=0.0
      XP4(I)=0.0
      NS4(I)=0
      BA4(I)=0.0
      IF(I.GT.5.OR.J.GT.5)GO TO 1
      A5(I,J)=0.0
      B5(I)=0.0
      XP5(I)=0.0
      NS5(I)=0
      BA5(I)=0.0
      A6(I,J)=0.0
      B6(I)=0.0
      XP6(I)=0.0
      NS6(I)=0
      BA6(I)=0.0
```

```
      IF(I.GT.4.OR.J.GT.4)GO TO 1
      A7(I,J)=0.0
      B7(I)=0.0
      XP7(I)=0.0
      NS7(I)=0
      BA7(I)=0.0
1     CONTINUE
      NA7=0
      SB7=0.0
      NA6=0
      SB6=0.0
      NA5=0
      SB5=0.0
      NA4=0
      SB4=0.0
      NA3=0
      SB3=0.0
      NA2=0
      SB2=0.0
C     ZERO SUMS FOR WLTM1
      P=0.0
      DA=0.0
      DS=0.0
      SN=0.0
      SX=0.0
      SY=0.0
      SYX=0.0
      SXX=0.0
C     GET CALIBRATION AND WEIGHTS FOR WLTM1.
      IF(LP.NE.1)WRITE(LP,199)
199   FORMAT(1H1,2X,"CALIBRATION FACTORS FOR REAL TIME ANALYSIS"/
     *1H0,2X,"WEIGHTS FOR ANEMOMETERS ARE"/)
      IF(LU1.EQ.1)WRITE(1,99)
99    FORMAT("INPUT WEIGHTS"/)
      DO 2 I=1,21
      IF(LU1.EQ.1)WRITE(1,98)I
      READ(LU1,*)WT(I)
      IF(LP.NE.1)WRITE(LP,198)I,WT(I)
2     CONTINUE
98    FORMAT(I2,3X,"_")
198   FORMAT(1H ,I2,F10.5)
      IF(LU2.EQ.1)WRITE(1,97)
97    FORMAT("INPUT XCAL, YCAL",3X,"_")
      READ(LU2,*)XC,YC
      IF(LP.NE.1)WRITE(LP,197)XC,YC
197   FORMAT(1H0,2X,"XCAL,YCAL ARE",F10.7,",",F10.7)
      IF(LU2.EQ.1)WRITE(1,96)
96    FORMAT("INPUT # OF SENSOR",3X,"_")
      READ(LU2,*)IS
      IF(LP.NE.1)WRITE(LP,196)IS
196   FORMAT(1H0,2X,"SENSOR #",I4)
      IF(LU2.EQ.1)WRITE(1,95)
95    FORMAT("INPUT TIME INTERVAL IN MINUTES FOR WLTM3",3X,"_")
      READ(LU2,*)MN
      IF(LP.NE.1)WRITE(LP,195)MN
195   FORMAT(1H0,2X,"LEAST SQUARES READOUT EVERY",I3," MINUTES")
C     DETERMINE IF .5K OR 2K WANTED.
      IF(LU2.EQ.1)WRITE(1,93)
93    FORMAT("ENTER 0 FOR .5K OR 2 FOR 2K",3X,"_")
      READ(LU2,*)IARRY
```

```
      IF(IARRY.EQ.0)WRITE(LP,193)
      IF(IARRY.EQ.2)WRITE(LP,200)
193   FORMAT(1H0,2X,"ANALYSIS FOR THE 1/2 K ARRAY")
200   FORMAT(1H0,2X,"ANALYSIS FOR THE   2 K ARRAY")
      IF(LU3.EQ.1)WRITE(1,92)
92    FORMAT("INPUT 0 OR 1 FOR SUBS DESIRED"/
     *"OR TO DESIGNATE OTHER PARAMETERS")
      IF(LP.NE.1)WRITE(LP,192)
192   FORMAT(1H0,2X,"SUBS DESIRED OR OTHER PARAMETERS")
91    FORMAT("IW1",3X,"_")
90    FORMAT("IW2",3X,"_")
89    FORMAT("IW3",3X,"_")
88    FORMAT("IW4",3X,"_")
87    FORMAT("IW5",3X,"_")
191   FORMAT(1H ,2X,"IW1",I5)
190   FORMAT(1H ,2X,"IW2",I5)
189   FORMAT(1H ,2X,"IW3",I5)
188   FORMAT(1H ,2X,"IW4",I5)
187   FORMAT(1H ,2X,"IW5",I5)
      IF(LU3.EQ.1)WRITE(1,91)
      READ(LU3,*)IW1
      IF(LP.NE.1)WRITE(LP,191)IW1
      IF(LU3.EQ.1)WRITE(1,90)
      READ(LU3,*)IW2
      IF(LP.NE.1)WRITE(LP,190)IW2
      IF(LU3.EQ.1)WRITE(1,89)
      READ(LU3,*)IW3
      IF(LP.NE.1)WRITE(LP,189)IW3
      IF(LU3.EQ.1)WRITE(1,88)
      READ(LU3,*)IW4
      IF(LP.NE.1)WRITE(LP,188)IW4
      IF(LU3.EQ.1)WRITE(1,87)
      READ(LU3,*)IW5
      IF(LP.NE.1)WRITE(LP,187)IW5
      WRITE(1,85)
85    FORMAT("ENTER FILE # ON TAPE",3X,"_")
      READ(1,*)IWZ
      IF(LP.NE.1)WRITE(LP,185)IWZ
185   FORMAT(1H0,2X,"TAPE FILE #",I2)
      WRITE(1,84)
84    FORMAT("INPUT TIME INTERVAL IN SECONDS",3X,"_")
      READ(1,*)MS
      IF(LP.NE.1)WRITE(LP,184)MS
184   FORMAT(1H0,2X,"AVERAGING TIME IS",I3," SECONDS")
      WRITE(1,83)
83    FORMAT(/"THAT'S ALL, THANKS")
      STOP
      END
      END$
```

```
$WLTMG T=00004 IS ON CR00002 USING 00014 BLKS R=0114

FTN4,L
      PROGRAM WLTMG,3
C*************************************************
      COMMON F,S(22),IT(6)
      COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
      COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
      COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
      COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
      COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
      COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
      COMMON P,NB,MN,IS,MS,IARRY
      COMMON IW1,IW2,IW3,IW4,IW5,IWZ
      COMMON WT(21)
      COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
      DIMENSION ITM(5),IDT(94),IDATA(100)
      DIMENSION ST(37)
      DIMENSION NW4(3),MON(2)
      EQUIVALENCE (ITM(1),IDATA(1)),(IY,IDATA(6)),
     *(IDT(1),IDATA(7))
      DATA NW4/2HWL,2HTM,2H4 /
1     CONTINUE
      CALL EXEC(3,611B)
      CALL EXEC(13,9,ISTAT)
      ISTT=IAND(ISTAT,1B)
      IF(ISTT.NE.0)GO TO 1
      ISTT=IAND(ISTAT,200B)
      IF(ISTT.EQ.0)GO TO 2
      CALL EXEC(3,311B)
2     CONTINUE
      CALL EXEC(1,111B,IDATA,100)
      CALL EXEC(3,211B)
      SEC=MS
      IF(MS.EQ.0)SEC=0.5
      IDAY=ITM(5)
      LIT=ITM(3)
      CALL DATE(IDAY,MON,IY)
      WRITE(6,99)IS,SEC,IW3,ITM(4),ITM(3),ITM(2),IDAY,MON,IY
99    FORMAT(1H1,"ANALYSIS OF CH #",I3,", WITH",F5.1," SEC AVG."/
     *1H ,"WITH SLIDE FACTOR OF",I3/
     *1H ,"FOR DATA BEGINNING",I3,":",I2,":",I2," ON",I3,1X,2A2,I
      CALL EXEC(11,ITM,IY)
      IDAY=ITM(5)
      CALL DATE(IDAY,MON,IY)
      WRITE(6,98)ITM(4),ITM(3),ITM(2),IDAY,MON,IY
98    FORMAT(1H ,"ANALYSIS STARTED",I3,":",I2,":",I2," ON",I3,1X,
      IF(IW1.EQ.0)GO TO 3
      CALL WLTM5
3     CONTINUE
      DO 67 IRPT=1,32767
      F=0.0
      DO 4 I=1,37
4     ST(I)=0.0
      DO 6 I=1,200
      CALL EXEC(1,111B,IDATA,100)
      CALL EXEC(13,9,ISTAT)
      ISTAT=IAND(ISTAT,200B)
      IF(ISTAT.NE.0)GO TO 68
      F=F+1.
```

```
      DO 5 J=1,36
    5 ST(J)=ST(J)+FLOAT(IDT(J))
      ST(37)=ST(37)+FLOAT(IDT(IS))
      IF(MS.EQ.0)GO TO 7
      ISTAT=MOD(ITM(2),MS)
      IF(ISTAT.NE.0)GO TO 6
      IF(ITM(1).GE.50)GO TO 6
      GO TO 7
    6 CONTINUE
    7 CONTINUE
      DO 8 J=1,6
    8 IT(J)=IDATA(J)
      IF(IT(3).EQ.LIT)GO TO 9
      ISWTM=IT(3)+IT(4)*1000B
      CALL PSSW(ISWTM)
      LIT=IT(3)
    9 CONTINUE
C     CHECK FOR .5K OR 2K RANGE
      IF(IARRY.LE.1)GO TO 12
      K=0
      DO 10 I=1,21,4
      K=K+1
   10 S(K)=ST(I)*XC/F
      DO 11 I=22,36
      K=K+1
   11 S(K)=ST(I)*XC/F
      GO TO 14
   12 CONTINUE
      DO 13 I=1,21
   13 S(I)=ST(I)*XC/F
   14 CONTINUE
      S(22)=ST(37)*YC/F
C     SUM ALL POINTS.
      P=P+F
      IF(IW1.EQ.0)GO TO 15
      CALL WLTM1
   15 CONTINUE
      CALL WLTM2
      IF(MN.EQ.0)GO TO 67
      MO=MOD(IT(3),MN)
      IF(MO.NE.0)GO TO 67
      IF(IT(2).NE.0)GO TO 67
      IF(IT(1).GE.50)GO TO 67
      CALL WLTM3
   67 CONTINUE
   68 CONTINUE
      IF(IWZ.LE.1)GO TO 16
      CALL EXEC(3,211B)
      CALL EXEC(3,1411B)
      GO TO 17
   16 CALL EXEC(3,411B)
   17 CONTINUE
      IF(IW4.NE.1)GO TO 18
      CALL WLTM5
   18 CONTINUE
      CALL WLTM3
      CALL EXEC(10,NW4)
   69 CONTINUE
      STOP
      END
```

```
0119        END$
```

```
SWLTM1 T=00004 IS ON CR00002 USING 00006 BLKS R=0043

FTN4,L
      SUBROUTINE WLTM1
C*****************************************************************
C     WLTM1 IS USED TO MAKE THE CORRELATION PLOT OF A SENSOR
C     VERSUS A WEIGHTED AVERAGE OF 21 ANEMOMETERS FROM DATA
C     FROM MAG TAPE.
C************************************************
      COMMON F,S(22),IT(6)
      COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
      COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
      COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
      COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
      COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
      COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
      COMMON P,NB,MN,IS,MS,IARRY
      COMMON IW1,IW2,IW3,IW4,IW5,IWZ
      COMMON WT(21)
      COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
      CALL PLTLU(10)
      CALL SFACT(15.,10.)
      Y=S(22)
      X=0.0
      DO 1 I=1,21
1     X=X+S(I)*WT(I)
      SN=SN+1.0
      D=(Y-X)/10.
      DA=DA+D
      DS=DS+D*D
      SX=SX+X
      SY=SY+Y
      SYX=SYX+Y*X
      SXX=SXX+X*X
      Z=ABS(X)
      IF(Z.GE.4.75)X=4.75*X/Z
      X=X+5.0
      Z=ABS(Y)
      IF(Z.GE.4.75)Y=4.75*Y/Z
      Y=Y+5.0
      CALL PLOT(X,Y,3)
      CALL PLOT(X,Y,2)
      CALL PLOT(X,Y,3)
69    CONTINUE
      RETURN
      END
      END$
```

```
SWLTM2 T=00004 IS ON CR00002 USING 00021 BLKS R=0205

FTN4,L
      SUBROUTINE WLTM2
C***************************************************************
C     WLTM2 IS USED TO LOAD THE ARRAYS FOR THE LEAST SQUARES
C     CORRELATION FIT TO WEIGHTING FACTORS FOR DATA FROM MAG
C     TAPE.
C***************************************************
      COMMON F,S(22),IT(6)
      COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
      COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
      COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
      COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
      COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
      COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
      COMMON P,NB,MN,IS,MS,IARRY
      COMMON IW1,IW2,IW3,IW4,IW5,IWZ
      COMMON WT(21)
      COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
      DIMENSION D(11),NS(11),XP(11)
      IF(IW2.GT.1.)GO TO 68
      NB=0
      NA7=0
      NA6=0
      NA5=0
      NA4=0
      NA3=0
      NA2=0
      DO 67 INOW=1,IW5
      GO TO (1,2,3,4,5,6),INOW
1     JCNT=4
      KCNT=7
      GO TO 7
2     JCNT=5
      KCNT=6
      GO TO 7
3     JCNT=5
      KCNT=5
      GO TO 7
4     JCNT=6
      KCNT=4
      GO TO 7
5     JCNT=8
      KCNT=3
      GO TO 7
6     JCNT=11
      KCNT=2
7     CONTINUE
      NA=1
      DO 9 J=1,JCNT
      NS(NA)=0
      XP(NA)=0.0
      DO 8 K=1,KCNT
      L=(J-1)*KCNT+K+IW3
      IF(L.LT.1.OR.L.GT.21)GO TO 8
      IFLAG=L
      NS(NA)=NS(NA)+1
      XP(NA)=XP(NA)+FLOAT(L)
8     CONTINUE
```

```
      IF(NS(NA).EQ.0)GO TO 9
      ADEC=NS(NA)
      XP(NA)=XP(NA)/ADEC
      NA=NA+1
9     CONTINUE
      NA=NA-1
      GO TO (10,12,14,16,18,20),INOW
10    NA7=NA
      IF(IFLAG.LT.21)NA7=0
      NB=NB+NA7
      DO 11 J=1,JCNT
      XP7(J)=XP(J)
11    NS7(J)=NS(J)
      GO TO 67
12    NA6=NA
      IF(IW3.LE.-6)IFLAG=0
      IF(IFLAG.LT.21)NA6=0
      NB=NB+NA6
      DO 13 J=1,JCNT
      XP6(J)=XP(J)
13    NS6(J)=NS(J)
      GO TO 67
14    NA5=NA
      IF(IFLAG.LT.21)NA5=0
      NB=NB+NA5
      DO 15 J=1,JCNT
      XP5(J)=XP(J)
15    NS5(J)=NS(J)
      GO TO 67
16    NA4=NA
      IF(IFLAG.LT.21)NA4=0
      NB=NB+NA4
      DO 17 J=1,JCNT
      XP4(J)=XP(J)
17    NS4(J)=NS(J)
      GO TO 67
18    NA3=NA
      IF(IW3.LE.-3)IFLAG=0
      IF(IFLAG.LT.21)NA3=0
      NB=NB+NA3
      DO 19 J=1,JCNT
      XP3(J)=XP(J)
19    NS3(J)=NS(J)
      GO TO 67
20    NA2=NA
      IF(IFLAG.LT.21)NA2=0
      NB=NB+NA2
      DO 21 J=1,JCNT
      XP2(J)=XP(J)
21    NS2(J)=NS(J)
67    CONTINUE
      IW2=2
68    CONTINUE
      IF(NA7.LE.0)GO TO 25
      L=0
      DO 24 J=1,NA7
      KJ=NS7(J)
      D(J)=0.0
      DO 22 K=1,KJ
      L=L+1
```

```
      D(J)=D(J)+S(L)
   22 CONTINUE
      ADEC=KJ
      D(J)=D(J)/ADEC
      B7(J)=B7(J)+S(22)*D(J)
      DO 23 I=1,J
   23 A7(I,J)=A7(I,J)+D(I)*D(J)
   24 CONTINUE
   25 CONTINUE
      IF(NA6.LE.0)GO TO 29
      L=0
      DO 28 J=1,NA6
      D(J)=0.0
      KJ=NS6(J)
      DO 26 K=1,KJ
      L=L+1
      D(J)=D(J)+S(L)
   26 CONTINUE
      ADEC=KJ
      D(J)=D(J)/ADEC
      B6(J)=B6(J)+S(22)*D(J)
      DO 27 I=1,J
   27 A6(I,J)=A6(I,J)+D(I)*D(J)
   28 CONTINUE
   29 CONTINUE
      IF(NA5.LE.0)GO TO 33
      L=0
      DO 32 J=1,NA5
      D(J)=0.0
      KJ=NS5(J)
      DO 30 K=1,KJ
      L=L+1
      D(J)=D(J)+S(L)
   30 CONTINUE
      ADEC=KJ
      D(J)=D(J)/ADEC
      B5(J)=B5(J)+S(22)*D(J)
      DO 31 I=1,J
   31 A5(I,J)=A5(I,J)+D(I)*D(J)
   32 CONTINUE
   33 CONTINUE
      IF(NA4.LE.0)GO TO 37
      L=0
      DO 36 J=1,NA4
      D(J)=0.0
      KJ=NS4(J)
      DO 34 K=1,KJ
      L=L+1
      D(J)=D(J)+S(L)
   34 CONTINUE
      ADEC=KJ
      D(J)=D(J)/ADEC
      B4(J)=B4(J)+S(22)*D(J)
      DO 35 I=1,J
   35 A4(I,J)=A4(I,J)+D(I)*D(J)
   36 CONTINUE
   37 CONTINUE
      IF(NA3.LE.0)GO TO 41
      L=0
      DO 40 J=1,NA3
```

```
      D(J)=0.0
      KJ=NS3(J)
      DO 38 K=1,KJ
      L=L+1
      D(J)=D(J)+S(L)
38    CONTINUE
      ADEC=KJ
      D(J)=D(J)/ADEC
      B3(J)=B3(J)+S(22)*D(J)
      DO 39 I=1,J
39    A3(I,J)=A3(I,J)+D(I)*D(J)
40    CONTINUE
41    CONTINUE
      IF(NA2.LE.0)GO TO 69
      L=0
      DO 44 J=1,NA2
      D(J)=0.0
      KJ=NS2(J)
      DO 42 K=1,KJ
      L=L+1
      D(J)=D(J)+S(L)
42    CONTINUE
      ADEC=KJ
      D(J)=D(J)/ADEC
      B2(J)=B2(J)+S(22)*D(J)
      DO 43 I=1,J
43    A2(I,J)=A2(I,J)+D(I)*D(J)
44    CONTINUE
69    CONTINUE
      RETURN
      END
      END$
```

```
SWLTM3 T=00004 IS ON CR00002 USING 00011 BLKS R=0091

FTN4,L
      SUBROUTINE WLTM3
C**************************************************************
C     WLTM3 IS USED TO COMPUTE THE FIT FOR WEIGHTING FACTORS
C     FOR DATA FROM MAG TAPE.
C*************************************************
      COMMON F,S(22),IT(6)
      COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
      COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
      COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
      COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
      COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
      COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
      COMMON P,NB,MN,IS,MS,IARRY
      COMMON IW1,IW2,IW3,IW4,IW5,IWZ
      COMMON WT(21)
      COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
      DIMENSION A(11,11)
      WRITE(6,99)IT(4),IT(3),P
99    FORMAT(1H0,"AT",I3,":",I2," WITH",F10.0," POINTS")
      DO 69 L=1,IW5
      GO TO (1,3,5,7,9,11),L
1     CONTINUE
      IF(NA7.LE.0)GO TO 69
      DO 2 J=1,NA7
      BA7(J)=B7(J)
      DO 2 I=1,J
      A(I,J)=A7(I,J)
2     A(J,I)=A7(I,J)
      NG=7
      MTS=4
      CALL W3SUB(A,B7,XP7,NA7,NS7,SB7,BA7,NG,MTS)
      IF(NG.EQ.7)GO TO 69
      NB=NB-NA7
      NA7=-1
      GO TO 69
3     CONTINUE
      IF(NA6.LE.0)GO TO 69
      DO 4 J=1,NA6
      BA6(J)=B6(J)
      DO 4 I=1,J
      A(I,J)=A6(I,J)
4     A(J,I)=A6(I,J)
      NG=6
      MTS=5
      CALL W3SUB(A,B6,XP6,NA6,NS6,SB6,BA6,NG,MTS)
      IF(NG.EQ.6)GO TO 69
      NB=NB-NA6
      NA6=-1
      GO TO 69
5     CONTINUE
      IF(NA5.LE.0)GO TO 69
      DO 6 J=1,NA5
      BA5(J)=B5(J)
      DO 6 I=1,J
      A(I,J)=A5(I,J)
6     A(J,I)=A5(I,J)
      NG=5
```

```
      MTS=5
      CALL W3SUB(A,B5,XP5,NA5,NS5,SB5,BA5,NG,MTS)
      IF(NG.EQ.5)GO TO 69
      NB=NB-NA5
      NA5=-1
      GO TO 69
7     CONTINUE
      IF(NA4.LE.0)GO TO 69
      DO 8 J=1,NA4
      BA4(J)=B4(J)
      DO 8 I=1,J
      A(I,J)=A4(I,J)
8     A(J,I)=A4(I,J)
      NG=4
      MTS=6
      CALL W3SUB(A,B4,XP4,NA4,NS4,SB4,BA4,NG,MTS)
      IF(NG.EQ.4)GO TO 69
      NB=NB-NA4
      NA4=-1
      GO TO 69
9     CONTINUE
      IF(NA3.LE.0)GO TO 69
      DO 10 J=1,NA3
      BA3(J)=B3(J)
      DO 10 I=1,J
      A(I,J)=A3(I,J)
10    A(J,I)=A3(I,J)
      NG=3
      MTS=8
      CALL W3SUB(A,B3,XP3,NA3,NS3,SB3,BA3,NG,MTS)
      IF(NG.EQ.3)GO TO 69
      NB=NB-NA3
      NA3=-1
      GO TO 69
11    CONTINUE
      IF(NA2.LE.0)GO TO 69
      DO 12 J=1,NA2
      BA2(J)=B2(J)
      DO 12 I=1,J
      A(I,J)=A2(I,J)
12    A(J,I)=A2(I,J)
      NG=2
      MTS=11
      CALL W3SUB(A,B2,XP2,NA2,NS2,SB2,BA2,NG,MTS)
      IF(NG.EQ.2)GO TO 69
      NB=NB-NA2
      NA2=-1
69    CONTINUE
      RETURN
      END
C***************************************************************
      SUBROUTINE W3SUB(A,B,XP,NA,NS,SB,BA,NG,MTS)
      DIMENSION A(11,11),B(MTS),XP(MTS),NS(MTS),BA(MTS)
      M=NA
      SB=0.0
      A11=A(1,1)
      IF(A11.EQ.0)GO TO 68
      DO 1 I=2,M
1     A(1,I)=A(I,1)/A11
      BA(1)=BA(1)/A11
```

```
      DO 5 J=2,M
      J1=J-1
      DO 3 I=J,M
      AS=0.0
      DO 2 K=1,J1
    2 AS=AS+A(I,K)*A(K,J)
      A(I,J)=A(I,J)-AS
      IF(I.GT.J)A(J,I)=A(I,J)/A(J,J)
    3 CONTINUE
      BS=0.0
      DO 4 K=1,J1
    4 BS=BS+A(J,K)*BA(K)
      AJJ=A(J,J)
      IF(AJJ.EQ.0)GO TO 68
    5 BA(J)=(BA(J)-BS)/AJJ
      M1=M-1
      DO 7 I=1,M1
      BS=0.0
      MI=M-I
      MI1=MI+1
      DO 6 J=MI1,M
    6 BS=BS+A(MI,J)*BA(J)
      BA(MI)=BA(MI)-BS
    7 CONTINUE
      WRITE(6,99)NG
   99 FORMAT(1H0,"FOR GROUPS OF",I3)
      WRITE(6,98)(NS(J),J=1,M)
   98 FORMAT(1H ,"#",11I6)
      WRITE(6,97)(XP(J),J=1,M)
   97 FORMAT(1H ,"X",11F6.1)
      WRITE(6,96)(BA(J),J=1,M)
   96 FORMAT(1H ,"Y",11F6.3)
      DO 8 I=1,M
      SB=SB+BA(I)
    8 CONTINUE
      WRITE(6,95)SB
   95 FORMAT(1H ,"SUM OF WEIGHTS =",F8.5)
      GO TO 69
   68 CONTINUE
      WRITE(6,94)NG
   94 FORMAT(1H0,"FOR GROUPS OF",I3," MATRIX IS SINGULAR")
      NG=-1
   69 CONTINUE
      RETURN
      END
      END$
```

$WLTM4 T=00004 IS ON CR00002 USING 00012 BLKS R=0097

```
FTN4,L
      PROGRAM WLTM4,3
C*************************************************************
C     WLTM4 IS A PROGRAM WHICH NORMALIZES THE RESULTS OF WLTM3,
C     PLOTS, REPORTS, AND PUNCHES A TAPE OF THESE RESULTS.
C     IT CAN ALSO RESCHEDULE WLTMG FOR A REPEAT WITH A DIFFERENT
C     SLIDE FACTOR.
C*************************************************
      COMMON F,S(22),IT(6)
      COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
      COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
      COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
      COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
      COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
      COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
      COMMON P,NB,MN,IS,MS,IARRY
      COMMON IW1,IW2,IW3,IW4,IW5,IWZ
      COMMON WT(21)
      COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
      DIMENSION NMG(3)
      DATA NMG/2HWL,2HTM,2HG /
      CALL EXEC(3,1004B)
      WRITE(4,99)NB
99    FORMAT(I3)
      DO 7 M=1,IW5
      GO TO (1,2,3,4,5,6),M
1     IF(NA7.LE.0)GO TO 7
      NG=7
      MTS=4
      CALL W4SUB(XP7,NA7,NS7,SB7,BA7,NG,MTS)
      GO TO 7
2     IF(NA6.LE.0)GO TO 7
      NG=6
      MTS=5
      CALL W4SUB(XP6,NA6,NS6,SB6,BA6,NG,MTS)
      GO TO 7
3     IF(NA5.LE.0)GO TO 7
      NG=5
      MTS=5
      CALL W4SUB(XP5,NA5,NS5,SB5,BA5,NG,MTS)
      GO TO 7
4     IF(NA4.LE.0)GO TO 7
      NG=4
      MTS=6
      CALL W4SUB(XP4,NA4,NS4,SB4,BA4,NG,MTS)
      GO TO 7
5     IF(NA3.LE.0)GO TO 7
      NG=3
      MTS=8
      CALL W4SUB(XP3,NA3,NS3,SB3,BA3,NG,MTS)
      GO TO 7
6     IF(NA2.LE.0)GO TO 7
      NG=2
      MTS=11
      CALL W4SUB(XP2,NA2,NS2,SB2,BA2,NG,MTS)
7     CONTINUE
      CALL EXEC(11,IT)
      WRITE(6,98)IT(4),IT(3),IT(2)
```

```
98    FORMAT(1H0,"ANALYSIS COMPLETED",I3,":",I2,":",I2)
      CALL EXEC(3,1004B)
      IF(IW4.EQ.1)GO TO 69
      IF(IW3.GE.0)GO TO 69
      IW3=IW3+1
      IF(IW3.EQ.0)IW4=1
      IW1=0
      IW2=1
C     ZERO OUT ARRAYS FOR WLTM2 AND 3
      DO 8 I=1,11
      DO 8 J=1,11
      A2(I,J)=0.0
      B2(I)=0.0
      NS2(I)=0
      IF(I.GT.8.OR.J.GT.8)GO TO 8
      A3(I,J)=0.0
      B3(I)=0.0
      NS3(I)=0
      IF(I.GT.6.OR.J.GT.6)GO TO 8
      A4(I,J)=0.0
      B4(I)=0.0
      NS4(I)=0
      IF(I.GT.5.OR.J.GT.5)GO TO 8
      A5(I,J)=0.0
      B5(I)=0.0
      NS5(I)=0
      A6(I,J)=0.0
      B6(I)=0.0
      NS6(I)=0
      IF(I.GT.4.OR.J.GT.4)GO TO 8
      A7(I,J)=0.0
      B7(I)=0.0
      NS7(I)=0
8     CONTINUE
      P=0.0
      CALL EXEC(10,NMG)
69    CONTINUE
      STOP
      END
C***********************************************************
      SUBROUTINE W4SUB(XP,NA,NS,SB,BA,NG,MTS)
      DIMENSION XP(MTS),NS(MTS),BA(MTS)
      CALL PLTLU(10)
      CALL SFACT(15.,10.)
      CALL LLEFT
      CALL PLOT(0.0,0.0,-1)
      CALL PLOT(3.5,1.0,3)
      SB=ABS(SB)
      DO 1 I=1,NA
      BA(I)=BA(I)/(SB*FLOAT(NS(I)))
      XV=XP(I)/2.+3.5
      YP=BA(I)*50.+1.
      IF(YP.LE.0.2)YP=0.2
      IF(YP.GE.9.8)YP=9.8
      CALL SYMB(XV,YP,0.14,NG,0.0,-1)
1     CONTINUE
      WRITE(6,99)NG
99    FORMAT(1H0,"NORMALIZED WEIGHTS FOR GROUPS OF",I3)
      WRITE(6,98)(NS(I),I=1,NA)
98    FORMAT(1H ,"#",11I6)
```

```
      WRITE(6,97)(XP(I),I=1,NA)
97    FORMAT(1H ,"X",11F6.1)
      WRITE(6,96)(BA(I),I=1,NA)
96    FORMAT(1H ,"Y",11F6.3)
      WRITE(4,95)(NG,NS(I),XP(I),BA(I),I=1,NA)
95    FORMAT(I2,",",I3,",",F5.1,",",F9.5)
      CALL LLEFT
      RETURN
      END
      END$
```

```
SWLTM5 T=00004 IS ON CR00002 USING 00018 BLKS R=0142

FTN4,L
      SUBROUTINE WLTM5
C***********************************************************
C     WLTM5 IS A PROGRAM WHICH WILL REPORT THE NECESSARY
C     INFORMATION ON PLOTS AND DRAW THE GRID IF REQUIRED.
C**************************************************
      COMMON F,S(22),IT(6)
      COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
      COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
      COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
      COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
      COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
      COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
      COMMON P,NB,MN,IS,MS,IARRY
      COMMON IW1,IW2,IW3,IW4,IW5,IWZ
      COMMON WT(21)
      COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
      DIMENSION NA(2),NS(2),NP(2),NFS(2),NFL(2)
      DIMENSION MON(2),NCH(2),NSEC(2)
      DATA NA/2HAV,2HG=/,NS/2HSD,2HV=/
      DATA NP/2H#P,2HTS/
      DATA NFL/2HFI,2HLE/,NFS/2HFS,2H= /
      DATA NSEC/2HSE,2HC /
      DATA NCH/2HCH,2H# /
      NY=54475B
      NX=54053B
      CALL PLTLU(10)
      CALL SFACT(15.,10.)
      CALL LLEFT
      CALL PLOT(0.0,0.0,-1)
      IF(IW1.EQ.0)GO TO 5
      CALL PLOT(0.5,5.0,3)
      CALL PLOT(9.5,5.0,2)
      CALL PLOT(5.0,0.5,3)
      CALL PLOT(5.0,9.5,2)
      CALL DASH(0.5,0.5,0.5,0.5,-1)
      CALL DASH(0.5,0.5,9.5,9.5,1)
      IF(IW1.LE.1)GO TO 69
      D=SX*SX-SN*SXX
      A=(SX*SY-SN*SYX)/D
      B=(SX*SYX-SY*SXX)/D
      X=-4.0
 1    CONTINUE
      Y=A*X+B
      Z=ABS(Y)
      IF(Z.LE.4.75)GO TO 2
      X=X+.5
      GO TO 1
 2    CONTINUE
      X=X+5.
      Y=Y+5.
      CALL PLOT(X,Y,3)
      X=4.0
 3    CONTINUE
      Y=A*X+B
      Z=ABS(Y)
      IF(Z.LE.4.75)GO TO 4
      X=X-0.5
```

```
      GO TO 3
4     CONTINUE
      X=X+5.
      Y=Y+5.
      CALL PLOT(X,Y,2)
      DATT=DA/SN
      DSTT=SQRT((DS/SN)-DATT*DATT)
5     CONTINUE
      CALL LLEFT
      CALL PLOT(0.,0.,-1)
      IDAY=IT(5)
      IYEAR=IT(6)
      CALL DATE(IDAY,MON,IYEAR)
      DAY=IDAY
      YEAR=IYEAR
      FILE=IWZ
      CHN=IS
      SEC=MS
      IF(MS.EQ.0)SEC=0.5
      FS=5./(XC*30.)
      CALL NUMB(1.0,9.0,0.14,DAY,0.0,-1)
      CALL SYMB(1.56,9.0,0.14,MON,0.0,3)
      CALL NUMB(2.25,9.0,0.14,YEAR,0.0,-1)
      CALL SYMB(1.0,8.5,0.14,NCH,0.0,3)
      CALL NUMB(1.56,8.5,0.14,CHN,0.0,-1)
      CALL NUMB(2.25,8.5,0.14,SEC,0.0,1)
      CALL SYMB(2.85,8.5,0.14,NSEC,0.0,3)
      CALL SYMB(3.40,8.5,0.14,NFL,0.0,4)
      CALL NUMB(4.10,8.5,0.14,FILE,0.0,-1)
      IF(IW1.EQ.0)GO TO 69
      CALL SYMB(1.0,8.0,0.14,NFS,0.0,3)
      CALL NUMB(999.0,999.0,0.14,FS,0.0,1)
      CALL SYMB(1.0,7.5,0.14,NY,0.0,2)
      CALL NUMB(999.0,999.0,0.14,A,0.0,3)
      CALL SYMB(999.0,999.0,0.14,NX,0.0,2)
      CALL NUMB(999.0,999.0,0.14,B,0.0,3)
      CALL SYMB(1.0,7.0,0.14,NA,0.0,4)
      CALL NUMB(999.0,999.0,0.14,DATT,0.0,3)
      CALL SYMB(3.0,7.0,0.14,NS,0.0,4)
      CALL NUMB(999.0,999.0,0.14,DSTT,0.0,3)
      CALL SYMB(1.0,6.5,0.14,NP,0.0,4)
      CALL NUMB(1.60,6.5,0.14,SN,0.0,-1)
      CALL LLEFT
69    CONTINUE
      IF(IW1.EQ.1)IW1=2
      RETURN
      END
      END$
```

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